Facilitators and Barriers to the Use of Hearing Devices, and Identity in Hearing Impaired Adolescents: Two Mixed-Methods Meta-Syntheses

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Abstract

Objectives: Despite many hearing impaired adolescents having hearing devices, some may choose not to use them at school. Additionally, teachers of this population may not use their remote microphones in the classroom. Understanding reasons for the use and non-use of these devices at school is an important step in ensuring these students gain the most out of their schooling. Gaining knowledge on how this population identifies in relation to hearing also provides insight into appropriate provisions of supportive services. Therefore, this study aimed to investigate the facilitators and barriers to the use of hearing devices at school among the hearing impaired adolescent population, as well as the facilitators and barriers to the use of remote microphones among teachers of hearing impaired adolescents (research question one). Additionally, the cultural identity of hearing impaired adolescents who use amplification was examined (research question two).

Methods: Two mixed-methods meta-syntheses were conducted, with literature from the past 20 years reviewed. Included sources were critically appraised and thematically analysed in order to identify revealed themes.

Results: Separate searches were conducted for the research questions through the use of Ovid (Medline), EMBASE, Cochrane, PsycINFO and Scopus databases. 16 studies were identified to address research question one and 18 were included in question two. The qualitative and mixed-methods studies scored highly overall, whilst quantitative studies and quantitative sections of mixed-methods studies rated lower for a number of reasons. Many facilitators and barriers were identified regarding hearing impaired adolescents' use of hearing devices at school. The most common facilitator related to students viewing their device as important, whilst social aspects were the most prevalent barriers to their use. No facilitators or barriers

were found in the use of bone conduction hearing aids in adolescents. No studies reported on the use of RMs in teachers of hearing impaired adolescents. A mix of cultural identities was found across studies, with most students identifying as “bicultural” (between the deaf or Deaf and hearing worlds).

Conclusions: Although some results for both research questions were more prevalent across the literature than others, the mix of results highlights the heterogeneity of the adolescent population. These findings can be used as a guide for those working with hearing impaired adolescents, however it is important to treat these students as individuals. Future research and reviews are needed on these topics to give more insight for those working with this population.

Keywords: hearing devices, hearing aids, cochlear implants, CIs, remote microphone systems, RM systems, hearing impairment, identity, adolescence, school.

Contents

List of Abbreviations

AC- air conduction

ADHD- attention deficit hyperactivity disorder

ALD- assistive listening device

ANOVA- analysis of variance

AoDC- Advisor on Deaf Children

APD- auditory processing disorder

ASD- autism spectrum disorder

ASL- American Sign Language

BC- bone conduction

BM- basilar membrane

CI- cochlear implant

DAS- Deaf Acculturation Scale

DIDS- Deaf Identity Development Scale

H/Aid- hearing aid

HI- hearing impaired

HOH- hard-of-hearing

NZ- New Zealand

PE- Physical Education

PICO- Population, Intervention, Comparison, Outcome

PICo- Population, Phenomena of Interest, Context

PRISMA- Preferred Reporting Items for Systematic Reviews and Meta-Analyses

QoL- quality of life

RM- remote microphone

RTD- Resource Teacher of the Deaf

SNR- signal-to-noise ratio

UK- United Kingdom

USA- United States of America

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Chapter 1. Background and Hearing Device Use

Hearing Loss

A global phenomenon, hearing loss currently affects more than 1.5 billion people worldwide, and is projected to be experienced by 2.5 billion people by 2050 as the population increases (World Health Organisation, 2021).

When any part of the auditory system has been damaged or is not functioning as it should, a hearing loss results. Hearing loss can be treated in many ways, with the range of options reflecting the variety of pathologies found. Audiological rehabilitation options, which will be discussed in further detail, include the following: air conduction hearing aids (AC H/Aids), bone conduction hearing aids (BC H/Aids), cochlear implants (CIs), auditory brainstem implants (ABIs) and assistive listening devices (ALDs) (Dobie & Van Hemel, 2004). However, not all people who could use these rehabilitation options choose to do so; less than 68 million people worldwide use H/Aids despite over 400 million people being able to benefit from their use. In fact, some who own these devices choose not to use them consistently, or even do not use them at all (McCormack & Fortnum, 2013).

General Effects of Hearing Loss

The impacts of having a hearing loss on people's quality of life (QoL) can be significant. They can include social isolation, withdrawal, depression, low self-esteem and difficulty participating in more challenging listening scenarios (Cacciatore et al., 1999; Dawes et al., 2015; Naramura et al., 1999; National Council on the Aging, 2000; Punch et al., 2019).

Effects of Hearing Loss on Adolescents

Hearing loss that is not sufficiently managed in order to help ensure successful communication, be it through amplification, sign language and/or communication strategies, can have a significant impact on adolescents during this important period in life. For adolescents, not being able to communicate successfully with others due to an unaided hearing loss can lead to a number of issues, such as social isolation, aggression and self-harm (Coll et al., 2009; Elkayam & English, 2003; Stevenson et al., 2017). Hearing impaired adults have reflected on their experiences of isolation, self-esteem issues, embarrassment, marginalisation and general difficulties in social situations (Bain et al., 2004; Leigh, 1999). Those who have a hearing impairment have been found to be at risk of having less awareness about potential career pathways (Furlonger, 1998).

Having a hearing impairment was found to have an impact on the career choices of adolescents in Punch and Hyde (2005) study, with some students limiting their options to careers that would lead to the least communication difficulties; one student reported their interest in pursuing a career involving more individual work, as opposed to teamwork, due to the least impact they felt this would have on communication.

This chapter covers information about hearing, types of hearing impairment and rehabilitation options for those with hearing impairment, with a focus on reviewing previous literature that has discussed facilitators and barriers to the use of H/Aids, BC Aids, CIs and remote microphone (RM) systems in the general population.

A Brief Background to Hearing

Hearing is a complex, yet sophisticated phenomenon, requiring many anatomical, physiological and psychological mechanisms to work together cohesively in order to be successfully achieved. Sound waves travel to the ear of the listener via air or bone conduction

(AC or BC) to the cochlea, causing the basilar membrane (BM) to move from the resulting transverse wave (Békésy & Wever, 1960; Dallos, 1992; Stenfelt, 2011). Whilst high frequency sounds are detected at the basal end of the cochlea, the apical end is responsible for detecting low frequencies (Békésy & Wever, 1960; Müller, 1991; Müller, 1996). Within the cochlea, the receptor cells, called outer hair cells (OHCs), are responsible for amplifying the transverse wave on the BM by approximately 60dB through electromechanical transduction. Conversely, the other receptor cells, the inner hair cells (IHCs) sense the movement caused by the OHCs in response to sound. They are responsible for mechanoelectrical transduction, transmitting the signal to the vestibulocochlear nerve (VIII) which sends the signal to the auditory cortex in the brain where it is then perceived as sound (Bredberg et al., 1965; Fettiplace, 2011; Fritzsch et al., 2011; He et al., 2000; Malcolm, 1974; Schwander et al., 2010). A wide frequency range, from 20 Hz to 20 kHz is able to be identified by a healthy human ear, allowing access to the most important frequencies of speech; 200-8kHz (Fardin & Farshi, 2016; Gray, 2000; Meecham, 1999).

Types of Hearing Loss

Location of the impairment within the auditory system can be used to describe a hearing loss, with the following descriptions commonly used: conductive hearing loss (CHL), sensorineural hearing loss (SNHL) and, a combination of the two, mixed hearing loss (MHL) (Lee & Bance, 2019).

Conductive Hearing Loss

Abnormalities involving the outer and/or middle ear can result in a CHL, of which there are many causes which will be briefly discussed.

When there is an abnormally formed pinna/ear canal (such as in microtia/atresia), or excessive cerumen/foreign objects in the ear canal, sound can be prevented from reaching the middle ear system at the intended intensities (Foden et al., 2013; Jinping et al., 2006; Lewis-Cullinan & Janken; Priwin et al., 2007; Siegert et al., 2007; Subha & Raman, 2006). Additionally, abnormalities in the tympanic membrane, such as perforations, can lead to a loss of sound transmission to the cochlea (Mehta et al., 2006; Park et al., 2015).

Pathologies involving the middle-ear system, such as a dislocation, stiffening or additional mass (e.g. otosclerosis), or erosion of the ossicular chain (e.g. cholesteatoma) can also cause a hearing loss (Carrillo et al., 2006; Grant & Grant, 1991; Gros et al., 2003; Jeng et al., 2003). Otitis media, characterised by an accumulation of fluid in the middle-ear space, is a common cause of CHL. This is experienced by almost all younger children, particularly around 2 years of age (Klein, 1994; Mandel et al., 2008). It is possible to have a combination of external and middle ear deformities, such as congenital aural atresia and tympanosclerosis (Declau et al., 1999; Stankovic, 2009; Tos & Stangerup, 1989)

Sensorineural Hearing Loss

Whilst the outer and middle-ear system may be healthy, an impairment in the inner ear and beyond, into the central auditory pathways, disrupts the signal. The result is a loss at particular frequencies which correlate with the specific site of impairment, due to the tonotopicity present in the auditory system from the cochlea to the brain (Colletti et al., 2005; Schlauch & Nelson, 2015; Wessinger et al., 1997). A SNHL results, and is commonly described as being either congenital or acquired in nature.

Congenital causes of SNHL are numerous; syndromes (e.g. Usher's and Waardenberg), peri-natal problems, such as viral diseases (e.g. cytomegalovirus, mumps), post-natal problems, such as hyperbilirubinemia and hypoxia can all cause an SNHL

(Diefendorf, 2015; Kayan & Bellman, 1990; Misono et al., 2011; Noubiap et al., 2014; Sadeghi et al., 2004; Sano et al., 2005; Sharma et al., 2006).

SNHL that is acquired can be attributed to causes such as ototoxicity, presbycusis and excessive noise exposure (Arslan et al., 1999; Fee Jr, 1980; Gates & Mills, 2005; Panici et al., 1993; Rabinowitz, 2000; Sajjadi & Paparella, 2008; Sauvaget et al., 2005; Schuknecht & Gacek, 1993). Meniere's disease, vestibular schwannomas and many other pathologies can be acquired and also give rise to an SNHL (Enander & Stahle, 1967; Suzuki et al., 2010).

Specific pathologies involving the cochlea nerve, such as is seen in Auditory Neuropathy Spectrum Disorder (ANSD), can mean that while there is a well-functioning auditory system (which includes up to the OHCs), the IHCs and/or the auditory nerve have an impairment. This results in the signal being unable to reach the auditory cortex (Amatuzzi et al., 2001; Starr et al., 1996).

On occasion, a pseudo-SNHL can occur and give rise to the false impression of there being an SNHL. Otosclerosis, for instance, is a middle-ear disorder causing fixation of the stapes, consequently stiffening the ossicular chain. The ability of the middle ear to transmit sound to the cochlea, therefore, is reduced. BC results are typically seen to be worse at 2 kHz and mimic an SNHL, due to the resonant frequency of the ossicles being at approximately this frequency (Steiger, 2015; Tonndorf, 1988).

Mixed Hearing Loss

It is possible to have a combination of both CHL and SNHL, which consequently results in an MHL. This is seen, for instance, in cases of children who have a combination of OME as well as an underlying genetic SNHL, or where chronic OME has caused pathogens to infect and destroy hair cells within the cochlea (Alabbasi et al., 2010; Klemm et al., 2009; Paparella et al., 1972).

Rehabilitation for Hearing Loss

Multiple options exist that can assist in the rehabilitation of those with a hearing impairment. Audiological rehabilitation options include AC H/Aids, BC H/Aids, CIs, ABIs and ALDs. Supplementary options to these rehabilitation options include counselling and education around the use of communication strategies. These will be discussed below in further detail.

Air Conduction Hearing Aids

There are multiple components that make up 'traditional' AC H/Aids. They include the following: a microphone or microphones to detect incoming sound, internal electronics which process the sound and apply any settings needed, an amplifier to provide the required gain for the user, and a receiver to then deliver the sound as sound waves to the ear (Dillon, 2012). These H/Aids are available in different styles. One main category of AC H/Aids includes those where the body of the H/Aid sits behind the ear, while the sound is delivered to the ear via a tube or wire. Behind the Ear (BTE) and Receiver In The Ear/In The Canal (RITE/RIC) are the two styles included within this category. While the receiver sits in the body of the BTE and the sound usually travels via a tube, conversely, in RITE/RIC H/Aids, the receiver lies within the canal and is connected to the main body of the H/Aid, typically by means of a wire (Palmer, 2009).

The second main category of AC H/Aids includes those that are custom made for the ear and contain all parts of the H/Aid within one shell. The styles range from those that sit more exteriorly, to those that sit completely in the ear canal and are barely visible to the naked eye. Included in this range are In the Ear (ITE), In the Canal (ITC), Completely in the

Canal (CIC) and Invisible in the Canal (IIC) H/Aids respectively (Dillon, 2012; Palmer, 2009).

Bone Conduction Hearing Aids

Conversely, BC H/Aids consist of a microphone, processor, amplifier and transducer, which is encapsulated within one device. This device is secured to the skull, usually on the mastoid bone, either surgically with a magnet attached to the underside of the skin over which the processor sits, or attached via a soft-band that sits around the head (Reinfeldt et al., 2015). These H/Aids are designed to bypass the middle-ear system and, thus, any outer or middle-ear pathologies. The temporal bone, in particular, is vibrated by the BC H/Aid in response to sound. These vibrations are then transmitted to and detected by the cochlea, which then carries out the remaining processes of hearing in the inner ear before sending the signal to the brain to be interpreted as sound (Stenfelt & Goode, 2005).

AC H/Aids are useful for people whose hearing loss is sensorineural, which mainly involves an impairment in the OHCs. They are also useful for those with CHL (without any complications such chronic discharge from the ear, for example). In contrast, BC H/Aids are more suited to those with a more chronic or permanent CHL, where AC H/Aids are unsuitable, such as in the previous cases mentioned of chronic discharge or microtia/atresia (Cass & Mudd, 2010; Dillon, 2012; Hol et al., 2005; Mylanus et al., 1998).

Cochlear Implants

Whilst both AC and BC H/Aids rely on at least the IHCs functioning well within the cochlea to be able to convert the received signal into electrical energy, CIs are an option for those who have an impairment in the IHCs; therefore, they are typically used as rehabilitation for those with severe to profound SNHL (Bird & Murray, 2008; Waltzman, 2006). CIs

consist of several parts which are required for the ability to hear. Externally, there is a processor, worn like an AC H/Aid on the ear, and a connected magnetised transmitting coil that sits on the skull over the temporal bone. Connected to the transmitter via a magnet, the receiver is implanted beneath the skin in the temporal bone and receives the signal from the transmitter via an antenna. An electrode array connected to the receiver is implanted in the inner ear, following the shape of the cochlea. In response to the transmitter, electrical pulses are sent by the receiver to this electrode array, thereby stimulating the auditory nerve. Following this, provided the auditory nerve is present and healthy, the signal is able to then be sent up to the brain and perceived as sound (Wilson, 2013; Wolf, 2020).

Auditory Brainstem Implants

In rarer cases where the auditory nerve is not present or functional (e.g. vestibular schwannomas), or in some severe cochlear impairment cases, an ABI may be required in order to attain hearing (Colletti et al., 2005; Lenarz et al., 2001). ABIs are akin to CIs in terms of components. The external system of an ABI is comprised of the following: a microphone, speech processor, transmitter coil and magnet. It is worn in much the same way as in the case of a CI (Wong et al., 2019). Similarly, the internal part of an ABI is comprised of the receiver-stimulator attached to a magnet, a ground electrode and electrode array (Wong et al., 2019). However, the site of implantation of the electrode array differs; whilst the cochlea is the site of electrode array implantation in CIs, the cochlear nuclei located in the brainstem is where the electrode array is implanted in the case of ABIs (Colletti & Shannon, 2005). By bypassing the impaired auditory nerve, the signal is then able to be delivered to the auditory cortex (Colletti et al., 2005).

Counselling

According to American Speech-Language-Hearing Association (2018), there are two types of counselling within the scope of practice for audiologists: informational counselling and personal adjustment counselling. Information counselling involves educating the client and/or family around the client's hearing loss and rehabilitation. Conversely, personal adjustment counselling entails providing the client and/or family with support regarding challenges faced in rehabilitation, in order to work towards self-management (Luterman, 2020; Sanders, 1975). Counselling is an important tool and can be used effectively for all clients, including paediatric populations through to older adults (Atkins, 2007; Boothroyd, 2007; Crowell et al., 2009; Korver et al., 2017; Kricos, 2006; Pacala & Yueh, 2012; Schmulian & Lind, 2020).

Communication Strategies

An additional part of comprehensive aural rehabilitation comprises of teaching clients with hearing loss communication strategies. According to Tye-Murray (2019) and Marrone et al. (2012), communication strategies can include the client asking their communication partner to help maximise their communication e.g. getting the client's attention first, facing the client whilst talking to them, using shorter sentences and so forth. Additionally, clients can modify their environment by attempting to minimise any background noise, for example. Clients can also learn to anticipate conversations and any hearing difficulties that might arise, as well as employ relaxation techniques to better cope and adapt to the situation (Tye-Murray, 2019).

Assistive Listening Devices

When H/Aids and CIs alone are not sufficient or appropriate, those with hearing impairments or auditory processing disorder (APD) can have better access to speech, as well as awareness of environmental sounds through the means of ALDs (Dillon, 2012; Kim & Kim, 2014). Designed to increase the signal-to-noise ratio (SNR), ALDs can be used in a wide range of settings, such as at work, school and home. These devices aid in the separation of background noise from the signal of interest, thereby helping to reduce listening fatigue (Brody, 2020; Kim & Kim, 2014).

There are many types of ALDs available; RM and infrared systems, and some of which can be used in large rooms like classrooms as a type of sound-field amplification, such as hearing loop systems (National Institute on Deafness and Other Communication Disorders [NIDCD], Hartley et al., 2010; Holmes et al., 2000; 2019). Other examples of ALDs include television and telephone listening devices and alarm or alert systems (Dillon, 2012; Holmes et al., 2000; Kim & Kim, 2014).

Despite the evident range of ALDs, they all share the same principle of overcoming distance and the effects of background noise on the signal of interest, and are typically comprised of the same fundamental components; a microphone to detect the signal of interest, a means of transmission of the signal depending on the device, such as via Bluetooth, radio-waves, infra-red light, or electromagnetic field, and a receiver (Lin, 2013). RM systems are a commonly used ALD and are often found in educational environments, such as schools (Fitzpatrick et al., 2010; 2019; NIDCD, 2019; Walker et al., 2019).

Classroom Acoustics and its Effects on Hearing Impaired Students

Sources of Noise Adversely Affecting the Classroom

Classrooms can be noisy learning environments. There are many sources of noise that can adversely affect students' abilities to hear the teacher and other peers in the classroom. Sources of these noises can include internal noise, external noise and classroom noise. External noise is created outside of the school and includes noise from sources such as construction work, traffic and so on. Internal noise originates from within the school, but outside of the classroom. This can include heating/ventilation systems, adjacent classrooms, noise from the hallway and so on. Noise that occurs within the classroom can included, for instance, people talking and noise from books and paper (Bess, 1999).

Classroom Acoustics

Poor classroom acoustics, which provide a perfect pathway for noise, can result in disruptive background noise during class time. The ratio of the signal of interest (in this case, the teacher) to the noise (background noise, such as students talking) can, therefore, be poor. Having this poor SNR results in the signal of interest competing with and being masked by the noise, thereby creating a challenging listening environment (Yang et al., 2012). It has been suggested that in order for adolescents with normal hearing to understand speech in the classroom, ambient noise levels should not exceed 40 dBA (Picard & Bradley, 2001). However, some studies have found noise levels in secondary school classrooms that vary between 58 and 69 dBA (Lundquist et al., 2000), 60 and 63 dBA (Avsar & Gonullu, 2010), and as well as from 60 to over 70 dBA (Canning & James, 2012; Shield et al., 2015). Ideally, the background level of noise in a classroom should be no more than 35 dBA, as recommended by American National Standards Institute [ANSI] (2010).

Reverberation in the Classroom

Due to poor classroom acoustics, noise can linger in the classroom and can subsequently be reverberated. Reverberation involves sound waves from the source of the signal reflecting off solid surfaces, such as desks in classrooms, and being broken up into multiple separate signals, thus leading to an elongation of the sound within an enclosed space. This results in students receiving both the original signal, as well as the reflected sound from the original signal. The reflections can then mask the original signal, resulting in the signal of interest sounding distorted, being difficult to decode, and ultimately hard for the listener to hear the speakers' message (Houtgast & Steeneken, 1973; Ljung & Kjellberg, 2009). The amount of reverberation can be defined in terms of reverberation time, where the signal of interest is measured to see how long it takes for the signal to decay by 60dB after the projection of the original signal has finished (Bess, 1999). ANSI (2010) recommends that the reverberation time in medium-sized classrooms should not exceed 0.6 seconds.

Effects of Reverberation on Hearing Impaired Students

Students with hearing impairments have been shown to be more affected by reverberation than those with normal hearing (Bess, 1999; Nabelek & Pickett, 1974). Nabelek and Pickett (1974) propose that, in particular in situations where the reflection of sound arrives later than the intended signal originally does, this could be due to listeners with impaired hearing not being able to temporally integrate complex information as successfully in the presence of reverberation as those with normal hearing.

Effects of Classroom Noise on Learning

Being able to hear clearly at school in hearing-based classrooms is essential for students' learning and experiencing of success at school. Auditory development and learning can be adversely affected by the presence of background noise, resulting in a degraded signal being received by the listener. Receiving a degraded signal can result in the need to allocate more cognitive resources to process the signal, thus negatively impacting on the resources needed to store what information is heard (Kjellberg et al., 2008; Pichora-Fuller, 2007; Pittman, 2008).

Poor SNRs in classrooms can negatively impact on students' learning as they struggle to hear the teacher's voice. It has been shown to negatively impact academic achievement, and reading comprehension, and create feelings of frustration and lead to a lack of concentration on tasks in adolescent students' with normal hearing (Connolly et al., 2013; Connolly et al., 2019; Minichilli et al., 2018; Suleman & Hussain, 2014). Consequently, this can lead to students falling behind in class and struggling to keep up with their peers (Karabiber & Vallet, 2003). Poor academic performance in school has been associated with violence later in life (Felson & Staff, 2006; Maguin et al., 1995; Maguin & Loeber, 1996).

Not surprisingly, adolescents with impaired hearing struggle even more to listen in background noise than their peers with normal hearing; Connolly et al. (2015) found that adolescent students with a hearing impairment reported feeling more negatively affected by poor acoustics in the classroom than their normal-hearing peers. It has been found that more cognitive effort is required for children with hearing impairments to process speech in noisy environments (Lewis et al., 2016). Therefore, it is even more crucial that adolescents with hearing impairments are able to listen well in the classroom.

A noisy classroom, coupled with reverberation can decrease the use of distance hearing, which is when sounds heard over a distance are not only audible, but are also

intelligible (Flexer, 2004). Thus, the end result is a poor listening experience and learning environment for hearing impaired adolescents, potentially affecting their performance at school and opportunities in adulthood.

Desired Signal-to-Noise Ratio

By placing acoustic traps, such as carpet on classroom walls, and reducing the number of reflective surfaces, such as polished floors, reverberation and its subsequent effects can be minimised (Pääkkönen et al., 2015). For students who have a hearing impairment, an SNR of +15 or better is considered adequate to ensure comfortable listening in the classroom (ANSI, 2002; Hamzavi et al., 2001). However the presence of these sound-attenuating features in classrooms, as well as amplification from AC and BC H/Aids and CIs is not necessarily enough to achieve the desired SNR for hearing impaired students. RM systems, however can help to achieve such desired levels of SNR, assisting in overcoming negative effects regarding distance from the speaker, background noise and reverberation (Davies et al., 2001).

Remote Microphones

In the past, RM systems were known as FM systems due to the use of frequency modulation as the mode of transmission of the signal of interest. However, in recent times with the development of technology and the use of digitally modulated transmission, these assistive listening devices are now referred to as RM systems, and thus will be referred to as such throughout the rest of this study (Keller et al., 2020; Wolfe, 2016).

To assist in overcoming a poor SNR within the classroom environment, school students can use an RM system, which is designed to increase the SNR by approximately 15-20 dB (Boothroyd, 2004). It involves the speaker wearing a portable transmitter. This

transmitter is attached to a microphone, which transforms the speaker's signal into typically a radio frequency signal; this signal then streams straight from the speaker's transmitter to the listener's receiver, which usually is coupled directly to a listener's H/Aids and CI processor (Fitzpatrick et al., 2009; Wolfe & Schafer, 2008). The H/Aids and CIs then amplify the signal received as per the H/Aids' prescriptions and the CIs' programming. RM systems can help to overcome barriers such as noise within the classroom that prevents the student from learning and participating (Luckner & Muir, 2001).

The default setting of the RM system is usually set so that it increases the signal by 10dB (American Academy of Audiology, 2011); however, this 10dB advantage can be changed to be more suited to noisier environments, where a greater SNR may be desired, as RM systems now can automatically adapt to the environment and increase the signal more if noise is detected.

Populations Who Benefit From Remote Microphones

These systems are a positive accessory for those with hearing impairment to help them access communication more easily (Thibodeau, 2014). Those with SNHL and CHL have been shown to receive benefit from using an RM system (Lewis et al., 2004; Moeller et al., 1996; Paccioretti et al., 1997; Shimada et al., 2018). This includes those with a range of severities of hearing losses (Hawkins, 1984; Paccioretti et al., 1997; Tharpe et al., 2003). Updike (1994) discovered that the greater the severity of the hearing loss, the greater the benefit from using the RM system.

RM systems have been found to be beneficial for those who have a unilateral hearing loss (Kenworthy et al., 1990; Paccioretti et al., 1997; Updike, 1994) and provide greater benefit than traditional H/Aids or contralateral routing of the signal (CROS) H/Aids alone (Boothroyd, 2004; Hawkins, 1984; Updike, 1994). Aside from being used with AC H/Aids,

RM systems can also be used with BC H/Aids and CIs (Lewis, 2010; Schafer & Thibodeau, 2004; Snik et al., 2005; Wolfe & Schafer, 2008).

Whilst RM systems can be useful for those with a hearing impairment, they have also been shown to be effective for people with hearing within normal limits, such as those who have APD, autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD) or a learning disorder (Friederichs & Friederichs, 2005; Hornickel et al., 2012; Johnston et al., 2009; Purdy et al., 2009; Schafer et al., 2012; Smart et al., 2018; Updike, 2006). In this case, the user just wears a receiver that does not amplify the signal like H/Aids or CIs do.

A Review of Facilitators and Barriers to the Use of Hearing Devices

Hearing Aids

Facilitators of Device Use. Having a positive attitude towards AC H/Aids was found across multiple studies to result in more use of these hearing devices in older adults (Brooks, 1989; Hickson et al., 2014; Wilson & Stephens, 2003). Counselling adult clients receiving H/Aids was also found to assist in increasing their daily usage (Brooks, 1985, 1989). Literature shows that clients accepting their hearing loss can assist in facilitating the use of their H/Aids (Brooks, 1989; Jerram & Purdy, 2001). Perceiving there to be a need for AC H/Aids, having high self-efficacy and support from others resulted in the facilitation of use of these H/Aids in Hickson et al. (2014)'s study of 160 elderly individuals.

Aberdeen and Fereiro (2014) found one participant felt closer to being "normal" when wearing his AC H/Aids, feeling as though without them he was "…not much good." Additionally, another participant in this study reported accepting her hearing loss and the need to use H/Aids despite acknowledging their limitations: "I made up my mind when I got

them [H/Aids] that I was going to use them." Thus, this further emphasises that a positive attitude towards the use of H/Aids will assist in the facilitation of their use, as discussed by Brooks (1989) and Jerram and Purdy (2001).

Dexterity and loudness discomfort thresholds were found to influence the use of AC H/Aids. Those older adults who had better dexterity and high loudness discomfort thresholds were more inclined to use their H/Aids (Humes et al., 2003). Additionally, the severity of hearing loss impacted the use of H/Aids in Solheim and Hickson (2017); the researchers found in their study of 181 elderly people with H/Aids that those with more severe hearing impairments were more likely to use their H/Aids.

Older adults who experienced positive major life events, such as being married or living with a new partner, changes in residence and other events, such as having more grandchildren they needed to be able to hear and wanting to better understand others, resulted in the facilitation of the use of their AC H/Aids (Kricos et al., 2007)

Additionally, Eriksson-Mangold et al. (1990)'s study of 156 hearing impaired older adults discovered that a provision of an AC H/Aid program designed to increase user comfort as well as ensure clients are educated about realistic expectations regarding their H/Aids showed positive effects with H/Aids use; an increase of H/Aid usage was observed among participants, suggesting that taking the time to educate and allow clients to acclimatise to their H/Aids is important in enabling a successful outcome.

A study was conducted in New Zealand on 54 people from the Māori population by Masters (2016) and examined the reasons for non-use of H/Aids in this population. Facilitators to the use of AC H/Aids included participants being in situations where they needed to communicate, during driving, talking on the phone, and for entertainment reasons, such as watching movies. This has been the only study of its kind conducted in New Zealand to date.

Barriers to Device Use. People have been found to reject the use and be unsuccessful users of H/Aids for numerous reasons; some examples of barriers to H/Aid use identified in older people include the following: issues relating to H/Aids not working in background noise and/or the aids picking up background noise, feedback, poor sound quality, not working on the phone, not being suitable for all environments, failing to work in humid climates, not restoring hearing to normal, not doing what clients thought they would, the H/Aids needing too many adjustments, poor fit and comfort of the H/Aids, the inconvenience of wearing them, interference with glasses and hats, the H/Aids being difficult to handle, clients forgetting to wear them, being fearful of losing them, minimising their need e.g. they have other priorities, the frequency of battery changes, the stigma associated with H/Aid usage, cosmetic concerns, poor self-efficacy, on-going costs associated with the ownership of H/Aids, the H/Aids breaking down, and clients having poor vision and/or dexterity (Aberdeen & Fereiro, 2014; Bertoli et al., 2009; Brooks, 1985; Brooks & Hallam, 1998; Cohen-Mansfield & Taylor, 2004; Driscoll & Chenoweth, 2007; Gianopoulos et al., 2002; Gopinath et al., 2011; Hartley et al., 2010; Kochkin, 2000, 2007; Lupsakko et al., 2005; Masters, 2016; Meyer et al., 2014; Öberg et al., 2012; Ritter et al., 2020; Tomita et al., 2001). Some of the most important factors identified across many of these studies, which contributed to the non-use of AC H/Aids, were insufficient benefit provided by and physical discomfort from wearing H/Aids (McCormack & Fortnum, 2013). Additional situations during which participants in Masters (2016) did not deem wearing their H/Aids to be necessary included when participants were in quiet situations, such as being at home alone, the presence of excessive background noise, exercising or being outside. In addition to specific situations, major negative life situations, such as death of a spouse, illness and loss of employment, were associated with less use of H/Aids (Kricos et al., 2007). Greater use of sign as opposed to

spoken language in adults using H/Aids has been associated with inconsistent use of this device on a day-to-day basis, whilst those who received tertiary education were more likely to use H/Aids (Dammeyer et al., 2017). This study also found those with less severe hearing losses were less likely to consistently use their H/Aids, which emphasises the findings of Solheim and Hickson (2017) reported previously.

Cochlear Implants

Facilitators of Device Use. CIs have been shown to improve people's overall life: Hallberg and Ringdahl (2004) studied the experiences of 17 adults who had received their implant from one to 12 years ago. It was discovered that having their CIs increased participants' self-esteem, independence, socialisation, confidence and feelings of self-worth. Additionally, nine adult participants who were aged between 18 and 60 years in Harris et al. (1995)'s study showed improvements in QoL and psychological well-being. However, there has not been a study conducted on the general population of those with CIs specifically as to the facilitators of their use in day-to-day life.

Barriers to Device Use. Barriers to the use of CIs reported in the paediatric population include the following: device failure, physical pain from CI stimulation, family issues such as divorce and death, and feeling unsupported using a CI (Archbold et al., 2009). Other children had non-auditory stimulation including facial twitching, whilst others were resistant to the idea of having a CI from the start, thus leading to the non-use of these CIs (Watson & Gregory, 2005). Post-lingually deafened adults fitted with CIs were more at risk of non-use when there was less perceived benefit noted (Summerfield & Marshall, 2000). Those with CIs who had less severe hearing losses were less likely to use their CIs

consistently, as well as those who relied more on sign than spoken language (Dammeyer et al., 2017).

Bone Conduction Hearing Aids

Facilitators of Device Use. Not having skin complications from the surgery for surgically implanted BC H/Aids was found to contribute to the consistent use of these devices in a study by O'Niel et al. (2014). This study investigated the outcomes of ten children and adolescents aged between three and 17 years of age, who were implanted due to having a CHL. Being satisfied with the comfort, user-friendliness, cosmetics and decrease in ear discharge due to no longer wearing AC H/Aids were reported by adults implanted in a study conducted by Macnamara et al. (1996); these factors could potentially act as facilitators to their use.

39 participants in the study by Stephens et al. (1996) were investigated to determine their experiences of their bone-anchored H/Aids. Numerous benefits were reported by participants regarding the use of these devices, such as being able to hear better, feeling more confident and the aids being easy to use. Additionally, Mylanus et al. (1995) reported an increase in listening in speech-in-noise, sound quality and comfort in 65 children and adults who wore a bone-anchored H/Aid when comparing to an AC H/Aid. However, these benefits were not described in relation to facilitators of participants' usage of their BC aids.

Barriers to Device Use. There is evidence of potential barriers to BC use in previous literature; although most participants in the study conducted by Dutt et al. (2002) used and were satisfied with their aids, some reported feeling the main issue was that it was hard to put in, followed by it being clearly visible, it making them feel self-conscious and tired, them

being able to hear too much noise, it not being very helpful or physically comfortable and, lastly, it being difficult to use. Approximately 40% of participants chose not to wear their aid all day, however it was not stated the exact reasons for each participant with regards to this finding.

Han et al. (2020) reported further barriers to BC H/Aid use, wherein postoperative complications involving infection of the wound and granulation at the site of abutment were responsible for four participants choosing not to use their aid consistently. A further eight participants did not use their aid consistently due to experiencing little benefit, physical pain and issues with noise, as well as troubles relating to losing their external device. One out of the 54 unilaterally fitted participants in Kruyt et al. (2020) also experienced physical pain from their aid, thus resulting in non-use of their aid.

Other factors found to be contributing to the non-use of BC H/Aids include issues with processor retention during sports and dressing/undressing, participants experiencing headaches, and the external device being too big (Hougaard et al., 2017). Furthermore, Stephens et al. (1996) found participants to speak of acoustical and practical disadvantages of their BC aids, which included points such as issues with wind noise, hearing in speech-in-noise and their aid being difficult to use with the telephone. These factors found in Stephens et al. (1996) did not appear, however, to be discussed with regards to being barriers to the use of BC aids.

Remote Microphones

Facilitators of Device Use. Family support, or lack thereof, and teachers' knowledge regarding RM systems and their student were found to act as potential facilitators or barriers of RMs in preschool and primary school children (Miranda & Brazorotto, 2018).

Additionally, this study found that teachers' previous experiences working with hearing impaired students could also act as a facilitator or barrier to the use of RM systems: students whose teachers had previous experience with this population were seven times more likely to use their RM in class. Furthermore, family engagement could also facilitate or deter the use of RMs, as well as the child's use of their hearing devices. A study by Archbold et al. (2015) found that those with a more severe hearing loss used their RM system more frequently than those with a milder hearing loss.

A recent study conducted by Barker (2020) explored attitudes toward the use of RM systems in primary school children and their teachers. Both teachers and hearing impaired students noted the importance and benefit of and had positive attitudes towards the equipment. Teachers reported feeling the device was easy to operate. Students and teachers working together to solve issues around the RM and remembering to use it every day helped to ensure its consistent use. The teachers receiving support from a number of sources, such as Resource Teachers of the Deaf (RTDs), Advisors on Deaf Children (AoDCs) and parents, regarding using the RM system, including demonstrations of the benefit of the RM, also promoted its use in the classroom. RM usage was found to be adopted as a normal part of daily classes, with students being able to self-manage their device due to routines that the teachers had established.

Barriers to Device Use. Adults relying more on sign language as a primary form of communication were less inclined to use an RM system, as well as those with less education, according to a study conducted by Dammeyer et al. (2017).

Examples of some challenges and barriers faced with regards to teachers' use of the RM system in Barker (2020) include anxieties related to keeping the RM safe because of its expense, to the point where other hearing impaired students' peers were not allowed and

relief teachers were not asked to use it. Challenges were faced by some teachers with regards to the connectability of the device; in some cases, it only connected to one ear, to two teachers accidentally, or it did not connect at all. In addition, there were some troubles relating to the charging of the RM, as well as the day-to-day management and organisation of this device. Some students were apprehensive to use their RM system initially, due to not wanting to appear different from their peers, and some still did not always consistently use their RM; one student found the receivers he wore were too long.

Summary

This chapter has discussed the mechanisms of hearing, types of and rehabilitation options for hearing loss, classroom acoustics, RM systems and the findings from literature regarding facilitators and barriers to the use of AC and BC H/Aids, CIs and RM systems in the general population. It is evident that many facilitators and barriers exist to the use of these hearing devices, however there has been a focus predominantly on the barriers to their use in the literature, as opposed to facilitators. H/Aids have been most focused on in previous studies, with not as much literature being evident regarding CIs, BC H/Aids and RM systems. Only one study appeared to investigate the use of RM systems in the classroom from teachers' perspectives (Barker, 2020).

Chapter 2. Cultural Identity

A Brief Introduction to Identity

Identity has been described as an "umbrella-term" that encapsulates what defines an individual as themselves (Sharma & Sharma, 2010). It serves many purposes, as it is a social-psychological construct. Some of the main functions of identity include helping to understand oneself, as well as giving direction and meaning in life through values, goals and commitments (Adams & Marshall, 1996). Additionally, identity serves to give oneself a feeling of free will and control, and it aids in a balance being achieved between commitments, values and beliefs. Finally, through one being aware of possibilities, the future and different choices, this allows oneself to recognise their potential (Adams & Marshall, 1996).

This chapter discusses how identity develops, with a specific focus on the adolescent population and the challenges faced during this time with regards to identity. Additionally, cultural identities, in relation to hearing, are explored in the general population who have hearing devices. Hearing-related identity will be referred to as "cultural identity" throughout the remainder of this study for ease of reporting and reading.

Theory of Identity Development

The formation and acquisition of identity is a complex phenomenon, usually occurring via assimilation and integration, involving the exploration of identities throughout one's lifetime (Ryan & Deci, 2012). The process of identity development is influenced by environmental factors such as family, peers, school, work and society (Grotevant, 1987). From birth, and throughout one's life, there are many challenges one faces and must overcome in order to achieve healthy psychosocial development and identity of themselves.

Erikson (1964) described this development from a psychosocial standpoint, in the form of the following eight stages, which correspond to age: “Trust vs Mistrust” (0-1.5yrs), “Autonomy vs Shame” (1.5-3yrs), “Initiative vs Guilt” (3-6yrs), “Industry vs Inferiority” (6/7—11/12yrs), “Ego Identity vs Role Confusion” (11/12-18yrs), “Intimacy vs Isolation” (young adulthood), “Generativity vs Stagnation” (middle-age) and “Ego Integrity vs Despair” (older adulthood) (Manning, 1988).

Development Prior to Adolescence

The development stage of “Industry vs. Inferiority” occurs just prior to adolescence, from the ages of approximately six through to 12. During this time, children are venturing further out into the world, embarking on their school and social journeys. The child realises that their abilities can be compared to those of other children and that there is a need to contribute to society. They begin to explore their abilities in order to help develop confidence and self-esteem. Industry is shown when a child develops confidence in their abilities and self-esteem, as well as realises the need to contribute to and find their role in society (Issawi & Dauphin, 2017). However, other children may start to have low self-esteem and confidence in their skills and abilities, as well as what they contribute societally. Thus, feelings of inferiority can emerge (Manning, 1988). Their own view of themselves, as well as the attitudes and actions of family members and society, can greatly influence and either enhance industry or inferiority. If industry is not successfully achieved, the virtue of competence is not achieved (Markstrom et al., 1998). The resulting flow-on effects may manifest into adolescence, with low self-esteem issues potentially being exacerbated; this can subsequently be reflected in their willingness to engage in school and contribute to society (Issawi & Dauphin, 2017).

Adolescence and Identity

The adolescent years can be a complex, emotional and challenging period, and is a time during which a lot of change takes place, regardless of whether one has a hearing loss or not. Throughout this period in life, there are large and significant emotional, social and psychological changes which can affect adolescents' communicative, emotional and psychosocial abilities (Hornsby, 2004). Forming an identity of oneself and, thus, learning more about oneself and one's values, is a huge challenge during the adolescent years (Josselson, 1994).

During 12 to 18 years of age, the corresponding developmental stage "Identity vs Role Confusion" occurs (Erikson, 1964). Within this period, adolescents are challenged to establish a balance between identity and role confusion; they are faced with the task of forming their own identity, whilst grappling with "fitting in" and trying to find peer groups that most align with their values. This difficult task involves testing out different roles, which have great influence on adolescents during this time (Erikson, 1964; Kroger, 2002). Adolescents begin to depend less on their families and seek approval more from their peers (Shulman et al., 1987). In this stage, either adolescents will be successful and establish their own identity, or, conversely could become unhappy and struggle to discover who they are in adulthood. Failure to achieve this stage of identity development could be due to pressure to be a certain identity and inability to find a peer-group which aligns with their values and supports their self-discovery, be it through parents or peers and so forth, (Block, 2011; Brown & Lohr, 1987; Erikson, 1964). If adolescents are indeed victorious in overcoming the challenges posed to them in this stage of identity development, the virtue of fidelity is achieved, whereby adolescents become loyal, committed and more sure of who they are (Markstrom et al., 1998).

The Role of Secondary School in the Formation of Identity

Secondary school is a crucial place that contributes to the development of identity in adolescents at this stage of life, where peers also take an important role in influencing adolescents' identity (Brown & Lohr, 1987; Grotevant, 1987; Rich & Schachter, 2012). Whilst it is important to form self-identity, it is equally as important to have a feeling of belonging and to gain social acceptance (Adams & Marshall, 1996).

Social environments at school can have a large impact on self-esteem and the forming of identity in adolescents, with those who are outsiders, as opposed to being within a group, reported to have lower self-esteem and, thus, not a strong sense of self (Brown & Lohr, 1987). Additionally, the status of those within groups has been shown to affect self-esteem (Brown & Lohr, 1987). It is known that adolescents with low self-esteem are at greater risk during adulthood of poor mental and physical health, engaging in criminal behaviour and having lower economic prospects (Steiger et al., 2014; Trzesniewski et al., 2006). However, there can be cases of outsiders who are not bothered about 'fitting in' who, therefore, have favourable levels of self-esteem, even more so than some of their peers who are within groups but are further down the social 'hierarchy' (Brown & Lohr, 1987).

Identity and Hearing Impairment

A model of cultural identity was developed by Glickman and Carey (1993) in an attempt to categorise those with hearing impairment according to the Deaf culture and Deaf community. The Deaf Identity Development Scale (DIDS) revealed four groups in which to group those with hearing impairment: "Hearing", "Marginal", "Immersion" and "Bicultural". Those identifying as "culturally hearing" value oral communication and view deafness as a disability and view this as only minimal part of their identity, whilst hearing is deemed "normal". People who fit between the hearing and Deaf worlds but do not feel as though they

belong to either are categorised as “culturally marginal”, while those who feel comfortable in and value both worlds and are classified as “bicultural”. Finally, this model states that those who are immersed in and associate with the Deaf world do not attempt forms of communication associated with hearing people, and view negatively those who are hearing as they believe them to be oppressive. Glickman and Carey (1993) viewed this model as a series of developmental stages, where it is assumed that culturally hearing and marginal people immerse themselves in the Deaf world and eventually end up in the “bicultural” category.

However, there are some limitations of this scale, such as that many who used this scale were identified as “bicultural”, leading to the suspicion that this category was interwoven in the other categories and, thus, difficult to separate. Therefore, the Deaf Acculturation Scale (DAS) was developed (Maxwell-McCaw & Zea, 2011), which was able to confidently separate biculturalism from being intertwined with “hearing”, “marginal” or “Deaf” identities.

Self-Identification Labels

Multiple labels have been used by participants across studies in the literature to determine their identity. Maxwell-McCaw and Zea (2011) identified multiple terms used by the participants, including “hearing impaired”, “hard-of-hearing”, “deaf”, “Deaf”, and “bicultural”. Those identifying as “hearing impaired” or “hard-of-hearing” were placed in the culturally hearing group, and those who were “deaf” were deemed as being “marginal”.

A range of self-identification labels was also evident in a study conducted by Leigh (1999), wherein 16 adults labelled themselves as “deaf”, 12 as “hearing impaired”, four as “hard-of-hearing”, one as someone with a hearing loss and one as “oral first” and “deaf second”. Most felt between the hearing and deaf worlds. However, none of the participants felt part of the Deaf world and many had had limited exposure to this community; this was

likely due to the fact that participants had been recruited through a group in which members usually rely on speech as their communication mode.

A mix of identities was evident across 243 hearing impaired adults in Bat-Chava (2000); the majority identified as “bicultural” (34%), followed closely by “culturally deaf” (33%) and “culturally hearing” (24%). A further 9% had “negative identities”, whereby neither oral communication nor sign language was viewed as important, attitudes toward deaf people were more negative and there was less association seen with a particular group.

All adult participants in a study carried out by McIlroy and Storbeck (2011) identified as either “Deaf” (n=3), “deaf” (n=3), “hearing impaired” (n=2) or “hard of hearing” (n=1). However, none of the participants in this study described themselves as bicultural. Hearing impaired adults from Denmark also showed a diversity in identities when using the DAS as a measure; out of the 742 participants, 256 identified as “bicultural”, 246 as “Deaf”, 189 as “hearing” and 51 as “marginal” (Chapman & Dammeyer, 2017). Cole and Edelmann (1991) examined identity classification in deaf adolescents; most participants identified as having a “dual” identity (n=35), whereby both hearing and Deaf communities are embraced. 12 identified as being “Deaf” and four as “hearing”. One 10 year old girl spoke of her identity equivocally, stating that she felt deaf when her CI was turned off, whilst hard-of-hearing with her CI turned on (Preisler et al., 2005).

Hearing Loss as Separate From the Definition of Self

Some people with a hearing loss do not see it as defining who they are, but rather it simply being a part of them: as one person said in Leigh (1999), which included 34 hearing impaired adult participants, “My hearing loss is part of who I am rather than defining who I am”.

Identity as an Ever-Changing Construct

Whilst it is evident from past literature that many identify with a social group in relation to their hearing, identity has been stated as being a fluid construct (Breivik, 2005; Leigh, 1999; McIlroy & Storbeck, 2011). Buckingham (2008) explains the fluidity of identity, as it changes according to different factors:

> On one level, I am the product of my unique personal biography. Yet who I am (or who I think I am) varies according to who I am with, the social situations in which I find myself, and the motivations I may have at the time… (p.1)

When asked if the cultural identity they chose had always been the same, whilst half of the participants that Leigh (1999) investigated in their study reported their cultural identity had remained the same throughout the years, the other half of the participants noted a change and development overtime in their perceived cultural identity.

Summary

Literature has made clear the complexities of identity and its development, particularly in the adolescent years. There appeared to be a range of cultural identities that hearing impaired people associated with across the literature, with many identifying as "bicultural". However, some choose not to view their hearing status as part of their identity. Additionally, identity has been established as being a fluid concept and, thus, appears to be subject to change overtime.

Research Rationale and Objectives

There has yet to be a review of the literature conducted regarding facilitators and barriers to hearing impaired adolescents' use of AC and BC H/Aids, CIs and RM systems in school. Additionally, there has not been a review investigating facilitators and barriers to

these students' teachers' use of RM systems in the classroom. It is evident in the general population that even those with hearing devices choose not to use them, therefore it is possible that this is occurring in the adolescent population. Not using one's hearing devices at hearing-based schools has the potential to negatively impact on students' learning and success, with detrimental effects lasting and continuing into adulthood.

The cultural identity of hearing impaired adolescents using hearing devices has also yet to be reviewed in the literature. Understanding more about adolescents and how they identify culturally can only serve to provide more insight for those working with these students so that rapport and trust can be built to help ensure the success of these students. It is quite possible that how these students identify culturally could have an impact on whether they use their hearing device consistently or not at all.

This study aims to fill these voids in the literature in order to summarise the literature in these areas from the past 20 years and provide those working with hearing impaired adolescents insight into this population and how they can be better supported to ensure consistent hearing device use during school. Additionally, this research seeks to provide a humanistic point of view to this study, helping to give professionals more awareness and a more holistic view of this population.

Mixed-Methods Meta-Syntheses

Reviews of the literature involve the synthesis, evaluation and interpretation of research on a particular topic, research question or phenomena (Kitchenham, 2004). These reviews can be used to inform guidelines for evidence-based practice and are a greatly respected means of synthesising research, providing evidence from a variety of settings and methods (Heyvaert et al., 2013; Kitchenham, 2004).

Quantitative studies can fail to capture the attitudes, behaviour and knowledge that qualitative studies investigate, whilst qualitative studies can forego the idea of cause and effect that help derive a prediction of social phenomena (Johnson & Onwuegbuzie, 2004; Steckler et al., 1992). Therefore, by including just one study type, sacrifices are made.

Mixed-methods meta-syntheses involve the revision of quantitative and qualitative sources, combining these findings in one study (Heyvaert et al., 2013). To combine both qualitative and quantitative findings, this involves using strategies such as using one set of results to influence how the other data set is designed or analysed, or combining results from studies after analysing the two separate datum (Bazeley, 2012). Due to its ability to encapsulate both qualitative and quantitative studies, this strategy allows for researchers to more extensively explore the research area of interest; studies included are not limited to be of one design (Johnson & Onwuegbuzie, 2004).

Therefore, mixed-methods meta-syntheses were conducted in order to investigate the two research questions. A convergent integrative approach was adopted for both research questions, following the protocol for mixed-methods systematic reviews outlined by Johanna Briggs Institute (Lizarondo L, 2020). This involves extracting and combining the results from qualitative and quantitative sources, with the addition of giving a narrative interpretation ("qualitizing") of the results from quantitative studies for ease of reporting and incorporating these findings into those of qualitative sources (Lizarondo L, 2020).

Research Questions

In response to the need to review these areas of the literature, the following questions were formulated:

1. What act as facilitators and barriers for hearing impaired adolescents to the use of AC and BC H/Aids, CIs and RM systems, and their teachers' use of RM systems at secondary school?
2. "What do hearing impaired adolescents who use hearing devices choose to identify culturally as?"

Chapter 3. Methods

This chapter discusses the specific methods employed by the researcher in order to conduct this study. Details regarding the protocol, eligibility criteria, information sources and search and search strategies used, as well as study selection, data collection, data items, critical appraisal of included studies, syntheses of results and software used are discussed below.

Protocol

Evidence-based Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) have been established and are aimed at systematic reviews and meta-analyses, containing a 27-point checklist for researchers in order to assist in the reporting of these studies. Many journals publishing systematic reviews endorse the use of PRISMA guidelines (PRISMA, 2015). Despite these guidelines having been developed for systematic reviews and meta-analyses (PRIMSA, 2015), this study was conducted in accordance with relevant guidelines as well respected guidelines do not yet exist for this type of study design.

Eligibility Criteria

The Population Intervention Comparison Outcome (PICO) framework (Richardson et al., 1995) can be used to assist researchers in their creation of research questions and guide in the creation of search strategies (Schardt et al., 2007). This framework is most commonly used for systematic reviews, therefore, due to the qualitative aspect of mixed-methods meta-syntheses, a modified version of this framework is better suited to encapsulating this aspect in the search (Lockwood et al., 2015): “PICo”, which stands for “Population, Phenomena of Interest, Context” (Lockwood et al., 2015; Murdoch University, 2021).

The recently developed "SPICE" (Sample Population of Interest Design Evaluation and Research type) framework has been claimed to be particularly useful for qualitative and mixed-methods study searches and was recommended for such studies by its creators, Cooke et al. (2012). However, in a recent study conducted by Methley et al. (2014), it was revealed that although the SPICE framework had greater specificity, it was not as sensitive as PICO, therefore resulting in the risk of appropriate sources being missed. Due to these findings, it was decided that PICo would be used to guide the search of literature in this study.

Research Question One

1. **Population:** Participants needed to be either adolescents (where the majority were aged between 13 and 18 years, or where adolescent data are able to be extracted from the data set) with a bilateral hearing impairment, or the parents or teachers of these adolescents. The adolescents were required to have had their H/Aid or CI and, if applicable, RM system for at least a year. Adolescents with known syndromes or intellectual disabilities affecting their cognition were excluded from the study in order to narrow the population of interest.
2. **Phenomena of Interest:** Facilitators and barriers to H/Aid or CI and RM system (only RM systems for teachers) were investigated.
3. **Context:** Adolescents and their teachers were required to be at secondary school for study or work.

Research Question Two

1. **Population:** Adolescents with a bilateral hearing impairment who had had their H/Aid or CI for at least a year were included. Adolescents with known syndromes or

intellectual disabilities affecting their cognition were excluded from the study in order to narrow the population of interest.

2. **Phenomena of Interest:** The identity, in relation to hearing, was investigated.
3. **Context:** Adolescents were required to be attending secondary school.

The search regarding cultural identity also included QoL and terms related to this as a section, due to the researcher being unsure at the time if there would be enough literature on cultural identity to be discussed in the thesis.

Studies from the year 2000 to the time of performing the search were included so as to review the more recent literature in these areas and to keep the study feasible. Articles from all languages were included in both searches to avoid bias in the study search and selection (Jackson & Kuriyama, 2019). Grey and unpublished literature were included in this study in order to capture as much literature as possible on the topics. Grey/unpublished literature can include dissertations, conference papers, research reports, newsletters, blogs and so on (Tyndall, 2008). The inclusion of grey/unpublished literature can contribute to and expand the findings of published studies, providing supplementary information that can enrich the data and fill in missing pieces otherwise not found by published studies (Adams et al., 2017; Mahood et al., 2014; Paez, 2017).

Information Sources

The final search for research question one was performed on the 11th of December, 2020, with research question two being searched on the 14th of December, 2020. Several databases were used to conduct both searches to ensure a wide range of and all relevant literature would be captured, without making the task unfeasible. It has been recommended for those planning research and identifying a research problem that a minimum of Ovid (Medline) or PubMed (which contains Medline), EMBASE and Cochrane be used for

conducting the search. This emphasises the importance of using multiple databases to do a search on a particular topic to ensure all relevant sources are identified. Ovid (Medline) was selected due to having better ability at mapping search terms to medical subject headings which are used to provide more relevant results (Marquette University, 2020). Current trials were included in the search using Cochrane due to the researcher wanting information on any current research being undertaken in the areas investigated. PsycINFO can be used to identify additional sources relating specifically to the areas of mental health and behavioural sciences (Bramer et al., 2017). Encompassing a wider range of journals than the Web of Science data base, Scopus has the largest indexes as well as single abstracts (Burnham, 2006; Falagas et al., 2008). For these reasons, Ovid (Medline), EMBASE, Cochrane, PsycINFO and Scopus were the databases used for the searches for both research questions.

After entering and running the search strategies in the databases for both research questions, the search results were exported to EndNote. Duplicates were subsequently removed by using the "Find Duplicates" function under the "Library" tab, whereby all sources EndNote identified as duplicates were displayed; the researcher went through them by hand to confirm this. Following the deletion of these duplicates, the author then sorted the remaining sources by author and subsequently title to ensure there were no remaining duplicates; any found were deleted.

All reference lists from the final sources included in the study were scanned to determine whether any missing relevant sources were to be incorporated in the final selection of sources. This 'citation snowballing' method approach to reference scanning of relevant sources has been shown to be very effective at identifying those sources that are more difficult to find (Greenhalgh & Peacock, 2005). The exception to this method was articles on QoL; it was clear that there were many more articles on this topic as opposed to cultural

identity, therefore the researcher had decided to focus solely on cultural identity to keep this study feasible.

Search

The searches for both questions were conducted by the researcher, with assistance from a Specialist Subject Librarian at the University of Canterbury. Keywords extracted from the corresponding research question were used when creating the search strategy for each question and database. As the study's aim was to review literature from the past 20 years at the time of the search, literature from the year 2000 and below were removed from both searches. The filter in each database to limit the search to the past 20 years was overlooked, therefore old sources were removed by hand in EndNote; the researcher filtered the sources by year. Following this, all sources below the year 2000 were deleted and not included in the count for how many sources were initially found. All grey/unpublished literature for both searches was found through the 'citation snowballing' method previously described. A methodology filter for qualitative filters was used in EMBASE and PsycINFO databases due to the search results being very large.

Search Strategies

The search strategies for Ovid (Medline) are provided for both questions as examples below. Quality of life is included in the search for research question two and is reflected in the search strategy for research question two below. The remaining database search strategies for research questions one and two are displayed in Appendix A and Appendix B respectively.

Table 1

Search Strategies Used for Q1

Search engine	Search strategy
Ovid (Medline)	1. Hearing Aids/ 2. Cochlear Implants/ 3. ((hearing or listening) adj2 (device* or aid*)).ti,ab,kf. 4. (remote microphone* or FM system* or RM system*).ti,ab,kf. 5. cochlear implant*.ti,ab,kf. 6. 1 or 2 or 3 or 4 or 5 7. ((school* or classroom* or pupil* or student* or educat*) adj10 (secondary or high or teen* or adolesc* or youth*)).ti,ab,kf. 8. ((parent* or mother* or father* or caregiver* or guardian* or teacher*) adj10 (child* or teen* or adolesc* or youth* or student* or pupil*)).ti,ab,kf. 9. 7 or 8 10. 6 and 9 11. (interview* or qualitative or experience* or attitude*).ti,ab,kf. 12. 10 and 11

Table 2

Search Strategies Used for Q2

Search engine	Search strategy
Ovid (Medline)	1. Hearing Aids/ 2. Cochlear Implants/ 3. cochlear implant*.ti,ab. 4. ((hearing or listening) adj2 (device* or aid*)).ti,ab. 5. 1 or 2 or 3 or 4 6. "Quality of Life"/ 7. ("quality of life" or "well being" or "well-being" or "life satisfaction").ti,ab. 8. Social Identification/ 9. ("body image" or "self-esteem" or "self-image" or "body dissatisfaction").ti,ab. 10. ("Group Identity" or "Social Identity" or "Ego Identity" or "Cultural Identity" or "Self-Concept").ti,ab. 11. 6 or 7 or 8 or 9 or 10 12. 5 and 11 (1363) 13. limit 12 to "adolescent (13 to 18 years)"

Study Selection and Data Collection Process

Following the search for sources, titles and abstracts of all sources found were screened by the researcher to assess their relevance to their respective questions. Subsequently, the full-text of the studies that were determined to be relevant by the researcher were read to determine further whether they fit the criteria previously discussed for inclusion in the final number of sources to be analysed. The final articles were then finalised for both questions. Final articles selected for research question two were separated into groups for cultural identity and QoL so that the final numbers in each of these areas could be determined. Once this step had been completed, the researcher re-read the full-texts of each article for each question, except for articles identified on QoL as this areas was decided not to be investigated further for reasons to be discussed. The researcher familiarised themselves further with the final identified literature and highlighted parts that were applicable to the question concerned. A third reading was conducted by the researcher to ensure all information relevant to the research questions was identified.

Data Items

Multiple factors were extracted from the studies. For both questions, the following data items were extracted: the country of origin of the study, the study type, the objective of study, the number, gender and age of the participants, the type of data collection and analysis employed.

In addition to the above measures collected, facilitators and barriers to H/Aid, CI and RM system use were extracted for research question one. The cultural identity of the adolescent participants was obtained for research question two.

Critical Appraisal of Included Studies

To investigate the quality, strength, consistency and quantity of evidence on a specific topic in the literature, and to help guide the design of future studies, critical appraisals are necessary (Burls, 2009; Krainovich-Miller, 2017; Meade & Richardson, 1997; Smith, 2009).

The Mixed Methods Appraisal Tool (MMAT), developed by Hong et al. (2018), is designed to be used to critically appraise qualitative, quantitative and mixed-methods study designs in systematic mixed studies reviews. Originally developed by Pluye et al. (2009), this tool has been developed and improved throughout the years. The 2011 version was piloted and the pilot version and official version were tested for reliability and efficiency (Pace et al., 2010; Pace et al., 2012; Souto et al., 2014; Souto et al., 2015). Results showed fair to perfect reliability (Pace et al., 2012; Souto et al., 2014). Additionally, the content of the tool was deemed to be valid by Pluye et al. (2009).

The 2018 version is the most up-to-date, and is based off re-works of the old versions. It consists of four study design categories: qualitative, quantitative randomized controlled trials, quantitative non-randomized, quantitative descriptive and mixed-methods. Within each of these sections are five questions used to critically appraise the corresponding source, with possible answers being “yes”, “no” and “cannot tell”. For studies with a single design, the five questions under the corresponding study design must be answered. However, in the case of mixed-methods studies, researchers should answer questions in the qualitative and corresponding quantitative sections, as well as those in the mixed-methods part (Hong et al., 2018).

The following table displays the questions answered by the researcher for each study, with reference to the corresponding study design:

Table 3

Questions From the MMAT for Qualitative, Quantiative (Descriptive) and Mixed-Methods Study Designs

Study type	Q1	Q2	Q3	Q4	Q5
Qualitative.	"Is the qualitative approach appropriate to answer the research question?"	"Are the qualitative data collection methods adequate to address the research question?"	"Are the findings adequately derived from the data?"	"Is the interpretation of results sufficiently substantiated by data"	"Is there coherence between qualitative data sources, collection, analysis and interpretation?"
Quantitative (descriptive).	"Is the sampling strategy relevant to address the research question?"	"Is the sample representative of the target population?"	"Are the measurements appropriate?"	"Is the risk of nonresponse bias low?"	"Is the statistical analysis appropriate to answer the research question?"
Mixed-method.	"Is there an adequate rationale for using a mixed methods design to address the research question?"	"Are the different components of the study effectively integrated to answer the research question?"	"Are the outputs of the integration of the qualitative and quantitative components adequately addressed?"	"Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?"	"Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?"

This version of the tool has shown strong validity of the tool's contents (Hong et al., 2019), with future studies needed to assess the interrater reliability and discriminatory validity (Hong et al., 2019). This tool is unique and advantageous due to the need for only one tool to critically appraise studies of different designs, rather than requiring a different tool for each type of study. Thus, it was decided that this tool would be used for the critical appraisal.

Each source was critically appraised using the MMAT, with all sources grouped under being either qualitative, quantitative or mixed-methods. All corresponding questions according to the study design group the sources belonged to were answered. The researcher used the tutorial attached with the tool which stated and explained each point to look for under each question in order to answer all of the questions necessary. Due to there being instances where the criteria were partially fulfilled, it was deemed appropriate to add in a fourth grade; "maybe".

To make the results easier to interpret for readers, scores were assigned to the grade given to each question in order to quantify these findings and were displayed in a table. The following scores were used: "2" for "yes", "1" for "maybe" and "0" for "no" or "cannot tell". Overall scores of quality for each source were given by adding the sub-scores from each question answered. Reasons for assigning grades less than "yes" were given for each relative question and noted in the table.

Synthesis of Results

Evidence-based practice is guided by the syntheses of research findings, as the integration and reporting of such findings involved in syntheses provides readers with a thorough analysis of studies relevant to a specific research question (Sandelowski et al., 2006).

Mixed-methods meta-syntheses studies can provide a summary of the available evidence related to the research question, develop theories and critically assess current recommendations in treatments, policies and programs (Pawson, 2006).

Thematic analysis is a widely adopted approach involving the creation of codes and themes extracted from qualitative data by means of a systematic and accessible method (Clarke & Braun, 2017). This analysis approach was deemed most suitable for this study as it provides understanding of thoughts, behaviour and experiences captured across the studies investigated. Additionally, it has been described as a flexible and powerful approach to the analysis of qualitative data (Clarke & Braun, 2017; Kiger & Varpio, 2020). An inductive approach to the data analysis was adopted, whereby themes are generated from the data rather than being influenced by preconceived knowledge and theories (Braun & Clarke, 2006). This ensures that the generated themes are linked strongly to the relevant data (Patton, 1990).

Due to the predominance of qualitative studies in the data set used, a thematic analysis approach was taken for both questions to analyse the data so as to provide a unified way of integrating the results from the different designs of studies found. This makes it simple for the reader to digest. Therefore, quantitative studies and quantitative sections of mixed-methods studies were analysed thematically.

This study employs the use of the guidelines created by Braun and Clarke (2012), which were first established in 2006 (Braun & Clarke, 2006), for conducting a thematic analysis. This protocol is widely used (Kiger & Varpio, 2020), and involved the use of the six following phrases for both questions when the researcher analysed both research questions:

1. Familiarisation with the final data: This involved ensuring a thorough understanding of the data by reading and re-reading the data, making sure to critically and analytically decipher the meaning of the data (Braun & Clarke, 2012). This was conducted by the researcher once the final sets of studies to be included were

determined. Carrying out this step ensured that they researcher had a thorough understanding of the relevant studies and their findings.

2. Coding of the data: Encompassing this step is the breaking down and coding of the relevant data to help identity and label relevant data features (Braun & Clarke, 2012). For research question one, the researcher coded data in each of the studies by looking at the data relevant to the question. Repeated ideas were placed into codes e.g. when reports of different students feeling embarrassed about their H/Aids/CIs/RM systems, this was grouped into the code "embarrassment". The coded data for research question one was separated into facilitators and barriers for ease of theme development, reporting and reading. For question two, the researcher identified all words used to describe participants' cultural identity.
3. Theme-searching: Following coding the data, the generated codes are investigated to determine overlap in and separation of the codes. This then guides the researcher to shape themes, wherein codes are grouped together under one theme if determined to overlap, or separated under different themes if they are considered different (Braun & Clarke, 2012). The researcher undertook this step for both questions, careful to not miss any overlap between codes and grouping codes into appropriate themes.
4. Theme-reviewing: This step of the guidelines involves the review of what the researcher has determined as potential themes. This is to ensure no themes have been missed and whether there needs to be merging or further separation of some themes (Braun & Clarke, 2012). The researcher did this for both questions, grouping themes together when overlap occurred.
5. Determining the themes: Once the review of the potential themes has occurred, the researcher is then able to finalise the themes. The themes need to address each

question appropriately, avoid overlapping with other themes and have a clear focus (Braun & Clarke, 2012).

6. Writing of the report: In the final phase, the report of the study's findings is written, however this can be taking place as the study is conducted, not just after all the data has been collected. The order in which the themes are presented should be carefully considered so as to be meaningful and logical (Braun & Clarke, 2012). This was conducted by the researcher for both questions.

For research question one, themes were ranked among each group of hearing device and, separately, across the hearing devices in terms of how many codes were within each theme, with those containing the most codes deemed to be the most prevalent. This gave the researcher an idea of the most important facilitators and barriers within each hearing group, as well as commonalities in themes observed across the studies.

Software

EndNote™ 20 by Clarivate Analytics was used to import all references found from the searches done for both questions. Duplicates were deleted from the libraries, then all studies that passed the abstract and title screening stage were grouped. All studies in this group were then assessed by the researcher reading the full text. Studies excluded after this process were grouped according to rationale for exclusion. The final studies chosen to be included in the study were then placed in a group.

Summary

This chapter has discussed in detail the methods involved in order to conduct both mixed-methods meta-syntheses, which includes the following: the protocol, eligibility

criteria, information sources and search and search strategies, study selection, data collection, data items, critical appraisal of included studies, syntheses of results and software used.

Chapter 4. Results for Research Question One

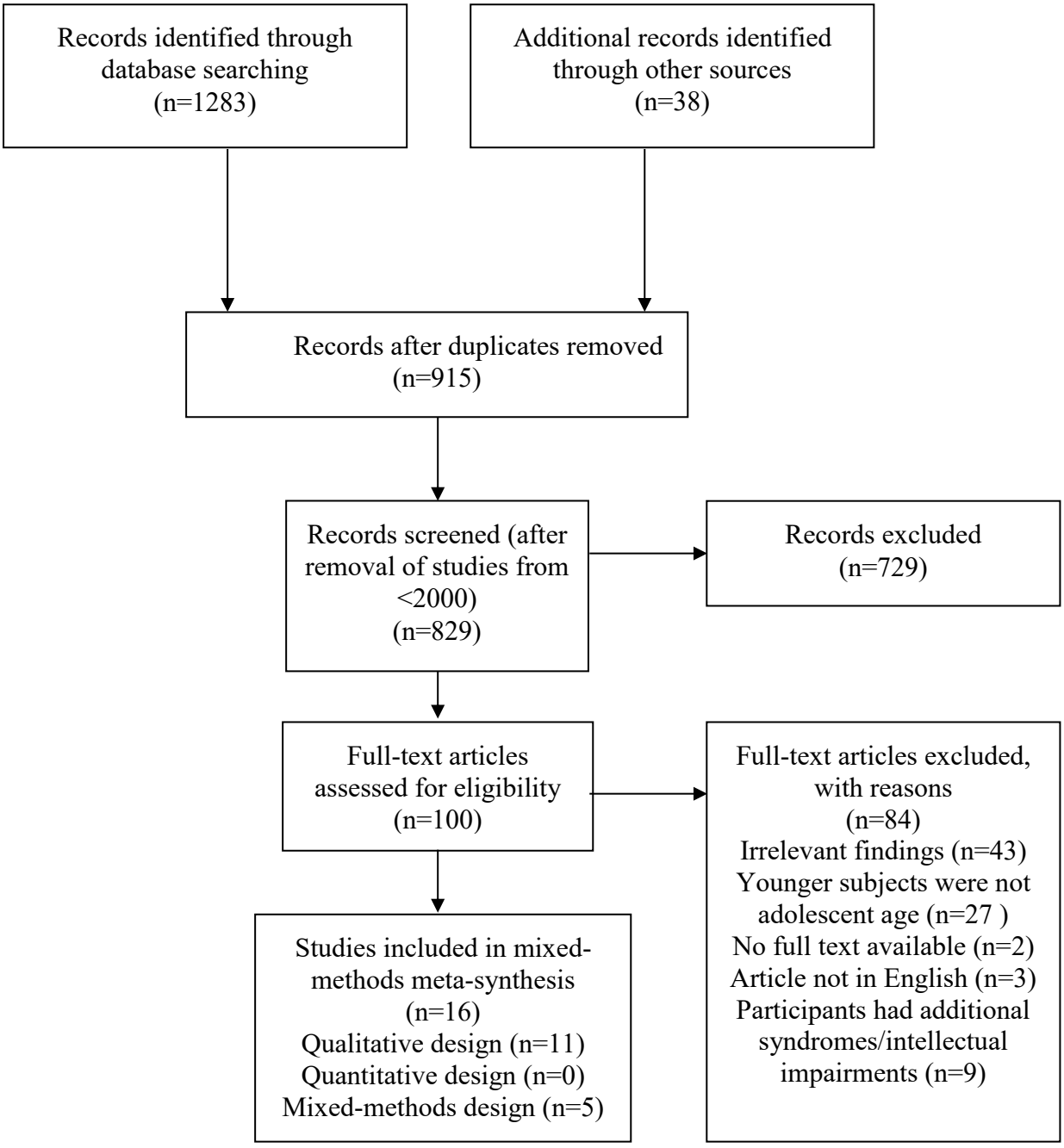
Within this chapter, details regarding the process for including the selected sources for research question one, as well as the results from the critical appraisal and synthesis of these sources for this question will be discussed.

Selection of Sources of Evidence

The following display depicts a flow diagram of the identification of relevant sources in the search process for research question one, using the PRISMA flow diagram template adapted from Moher et al. (2009).

Figure 1

PRISMA Flow-Diagram for Q1



A total of 16 sources were included in the final selection, investigating facilitators and barriers to the use of H/Aids, CIs and RM systems in hearing impaired adolescent students. Ten of these studies were qualitative, whilst the remaining four were of mixed-methods design.

Critical Appraisal Within Sources of Evidence

The results from the critical appraisal of all sources included in research question one are displayed in the following tables. Table 4 depicts the results from qualitative studies, whilst Table 5 displays results from studies of mixed-methods design.

Table 4

Critical Appraisal Results for Qualitative Studies (Q1)

Study	Q1	Q2	Q3	Q4	Q5	Total (/10)	Comments
Dalton (2013)	2	2	2	2	2	10	
Hilton et al. (2013)	2	1	2	2	2	9	Q2: form of data not mentioned.
Israelite et al. (2002)	2	2	2	2	2	10	
Kent & Smith (2006)	2	2	2	2	2	10	
Kops (2003)	2	2	2	2	2	10	
Luckner & Muir (2001)	2	2	2	2	2	10	
M. Park (2015)	2	2	2	2	2	10	
The Ear Foundation (2014)	2	2	2	2	2	10	
Wennergren (2008)	2	1	2	2	2	9	Q2: form of data not mentioned.
Wheeler et al. (2007)	2	2	2	2	2	10	
Woods (2020)	2	2	2	2	2	10	

Table 5

Critical Appraisal Results for Mixed-Methods Studies (Q1)

Study	Section	Q1	Q2	Q3	Q4	Q5	Total (/10)	Grand total (/30)	Comments
Elkayam & English (2003)	Qualitative.	2	2	2	2	2	10	28	
	Quantitative (descriptive).	2	2	1	2	2	9		Q3: reliability for self-assessments not reported.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.
Franks (2008)	Qualitative.	2	2	2	2	2	10	25	
	Quantitative (descriptive).	2	1	1	0 "cannot tell"	2	6		Q2: inclusion/exclusion criteria not mentioned Q3: questionnaire not piloted and reliability/validity of this tool not reported. Q4: reasons for withdrawal from study not stated.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.
Morris (2017)	Qualitative.	2	2	2	2	2	10	25	
	Quantitative (descriptive).	2	1	2	0 "cannot tell"	1	6		Q2: not mentioned if some did not participate and why. Q4: not mentioned if some did not participate and why. Q5: analyses not clear or justified for questionnaire.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.
Potts (2014)	Qualitative.	2	2	2	2	2	10	27	
	Quantitative (descriptive).	2	2	1	2	1	8		Q3: reliability/validity of questionnaire and speech detection tests not mentioned. Q5: unclear justification for statistical analysis.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.

Study	Section	Q1	Q2	Q3	Q4	Q5	Total (/10)	Grand total (/30)	Comments
Punch & Hyde (2005)	Qualitative.	2	2	2	2	2	10	25	
	Quantitative (descriptive).	2	1	1	0 "cannot tell"	2	6		Q2: not mentioned if some did not participate and why. Q3: good reliability/validity of scale, but then was modified for the study. Q4: not mentioned if some did not participate and why.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.

Qualitative Studies

It is clear that, overall, the qualitative studies rated highly for their quality, with overall scores ranging from “9” to “10/10”. Scores for question two were “1” for two studies (Hilton et al., 2013; Wennergren, 2008). Not mentioning the form of the data collected was the reason for this score in these studies.

Mixed-Methods Studies

Qualitative Section. All mixed-methods studies scored “10/10” for the qualitative section of the studies.

Quantitative Section. Aside from Morris (2017) which scored “2” for question three, four out of five studies scored “1” due to studies not reporting the reliability and/or validity of the measures used (Elkayam & English, 2003; Franks, 2008; Potts, 2014; Punch & Hyde, 2005).

Three out of the five studies scored “1” for question two (Franks, 2008; Morris, 2017; Punch & Hyde, 2005). These studies failed to state their inclusion and exclusion criteria for participants and/or did not mention if some chose not to participate and the justifications for this. Additionally, these studies scored “0” (“cannot tell”) for question four, due to not stating if participants did not participate and why not. The remaining two studies scored “2” for this question.

In regards to question five, Morris (2017) and Potts (2014) scored “1” for question five, while the remaning studies scored “2”, as the analyses in Morris (2017) were not clear and both studies did not provide a justification for their analyses. All studies scored “2” for question one.

Total scores for the quantitative section of these studies ranged from “6” to “9/10”.

Mixed-Methods Section. All studies scored “2” for questions one, two, three and four for the mixed-methods section. Scores for question five were “1” for all the studies, due to none of the studies gaining perfect scores for the qualitative and/or quantitative sections. Total scores for the mixed-methods portion were “9/10” across all studies. Grand total quality rating scores ranged from “25” to “28/30”.

Characteristics and Results of Individual Sources of Evidence

A range of data collection methods were used to gather information relevant to this question, including interviews (from unstructured to structured), conversations, questionnaires, scales, drawings and observations. Techniques used to analyse the relevant data included inductive thematic analysis, interpretative phenomenological analysis, the constant-comparative method, extraction and reporting of relevant comments, statistical analyses (e.g. correlations and multi-variate analysis of variance) and interaction analysis. The studies’ origin, design, aim, participant description, data collection, data analysis and findings relating to the facilitators and barriers to the use of hearing devices are reported in Table 6. Other findings not relevant to research question one from these studies are summarised and reported in Appendix C.

Table 6

Findings From Relevant Sources (Q1)

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Facilitators	Barriers
Dalton (2013) (Canada)	Qualitative.	To investigate students' (mild or moderate hearing loss) experiences. To look particularly at how the students coped at school, as well as their views of their hearing loss. Additionally, to provide recommendations for educators and researchers around participation of these students.	3 students. 18 (female), 20 (female) and 21 (male) years old.	Interviews (type not-specified).	Inductive thematic analysis.	—	- Attention-drawing. - Not a cure. - Forces one to work hard.
Elkayam and English (2003) (USA)	Mixed-method.	To modify and examine the effects of self-assessment/significant other questionnaires (which explore the emotional, communicative and social impacts of hearing loss) on the counselling of adolescents with hearing impairment.	15 adolescents with hearing loss (originally 20 (Male: 12; Female; 8. Age: 12-18 years old)). 15 significant others (SOs) who were normal-hearing peers of these adolescents with hearing impairment.	Questionnaires. Rating Scales. Informational/personal adjustment counselling. Follow-up survey.	Questionnaires: correlation between the subjects' and their significant others' responses was investigated. Interviews: inductive thematic analysis. Follow-up survey: descriptive statistics e.g. mean, range of responses.	H/Aids added to individuality.	- Attention-drawing. - Not a cure. - Less benefit for milder HI. - Physical discomfort. - Easy to lose.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Facilitators	Barriers
(Franks, 2008) (USA)	Mixed-method.	To investigate why students with hearing impairment decide not to use an RM system.	9 students with hearing impairment. Age: 8-18 years old. 5 parents, 15 special educators, 11 general educators, 7 speech and language teachers, 8 educational audiologists and 12 additional professionals involved with students with hearing loss.	Survey.	Statistical analyses to obtain percentages and P-values. Inductive thematic analysis for the open question in the survey. Graph for answers why students chose not to wear their RM system. General comments about the RM system also included separately.		- Embarrassment. - Bullying.
Hilton et al. (2013) (UK)	Qualitative.	To assess the outcomes of adolescents who have received a sequential CI after having had just one CI for numerous years. To provide insight to those (parents/children) considering unilateral, bilateral or sequential CI.	11 adolescents with hearing impairment. Age: 12-18 years old. Male: 4; Female: 7.	Semi-structured interview.	Interpretative phenomenological analysis.	- CIs improved overall life. - Students valued being able to be part of the hearing world. - Wearing them stopped bullying.	Highlighted differences with peers.
Israelite et al. (2002) (Canada)	Qualitative.	To examine the construction of identity in hearing impaired adolescents.	Seven adolescents with hearing impairment. Age: 14-17 years old.	Interviews (one open-ended and one semi-structured). Questionnaire.	Inductive thematic analysis with constant comparative method.	- Reliance on H/Aids. - Be like hearing peers re. communication.	—

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Facilitators	Barriers
Kent and Smith (2006) (NZ)	Qualitative.	To explore the perceptions of hearing impaired adolescents who use H/Aids.	16 adolescents with hearing impairment in mainstream education. Age: 12-17 years old.	Unstructured interviews.	Inductive thematic analysis.	- Students felt normal. - Comfort. - Discreteness. - H/Aids helpful. - Social benefits. - Support network.	- RM not viewed as normal. - RM a nuisance. - Bullying from using H/Aids. - Coping without.
Kops (2003) (USA)	Qualitative.	To assess the experiences of hearing impaired adolescents with CIs.	6 hearing impaired adolescents with CIs. Age: 14-18 years old. Male: 4; Female: 2.	Semi-structured interview.	Constant comparative method.	-"Improved independence" (minor theme) - Improvement in hearing and speech.	—
Luckner and Muir (2001) (USA)	Qualitative.	To identify the factors contributing to the achievement of students with hearing impairments in mainstream schools.	20 students with hearing impairments. Age: 12-19 years old. Male: 7; Female: 13. 19 parents of these students. 19 general education teachers. 13 teachers of the Deaf. 9 interpreters. 2 note takers.	Semi-structured interviews. General classroom observations.	Constant comparative method.	- Importance of H/Aids and RM. - Positivity towards CIs.	—

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Facilitators	Barriers
Morris (2017) (UK)	Mixed-method.	To investigate the reasons as to the use and non-use of RM systems at mainstream schools, specifically the influence of self-esteem, in adolescents with hearing impairments.	20 adolescents with hearing impairments. Male: 10; Female: 10.	Questionnaire. Rating scale. Structured interview.	Not reported.	- Longer use of RM. - Valued H/Aids and CIs. – - Not feeling anxious wearing H/Aids.	- Sound quality. - Hassle. - Embarrassment. - Coping without one. - Negative views.
M. Park (2015) (USA)	Qualitative.	To gain further understanding into the educational needs of children with CIs. To investigate whether the students' school programs met the five tenets of the Whole Child Initiative (Association for Supervision and Curriculum Development [ASCD], 2013)	6 participants. Age: 5-22 years old.	Semi-structured interviews. IEPs, report cards, standardized testing results and psychological reports. Academic work examples, classroom observations.	Direct observations and interviews: Interaction analysis. Inductive thematic analysis.	- Using only one communication method. - Parental views. - Access to environmental sounds.	—
Potts (2014) (UK)	Mixed method.	To investigate H/Aids non-usage in mainstreamed hearing impaired children.	6 hearing impaired students. Age: 9-14 years old. Male: 4; Female: 2.	Semi-structured interviews. Questionnaire. Speech discrimination tests.	Interviews: interpretative phenomenological analysis. Questionnaire and speech discrimination tests: Descriptive statistics e.g. percentages, scores.	—	- Stigma. - Bullying. - Cosmetic concerns. - Poor sound quality. - Unwanted noise. - Physical discomfort. - Feedback. - Little benefit.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Facilitators	Barriers
Punch and Hyde (2005) (Australia)	Mixed-method.	To explore the social participation of hearing impaired adolescents, as well compare these students' views of their social participation with career-decision making and social self-concept. To investigate and compare social loneliness in adolescents with and without hearing impairment.	65 students with hearing impairment. Age: 14.8-18.3 years old. Male: 29; Female: 36. 65 students without hearing impairment. Age and gender split unknown.	Questionnaire and semi-structured interviews. Interviews conducted only with 12 students (six male and six female; one in Year 10, five in Year 11 and six in Year 12).	Questionnaire: Multivariate analysis of variance. Multiple regression analyses. Inductive thematic analysis with constant comparative method.	—	- Feeling self-conscious using H/Aids or RM.
The Ear Foundation (2014) (UK)	Qualitative.	To investigate the opinions of adolescents with hearing impairments on RM systems, as well as those of professionals. Additionally, to trial the Phonak Roger system in challenging outdoor environments and gather the experiences of these adolescents and their professionals.	20 adolescents. Age: 11-17 years old. H/Aids: 7; CIs: 13. Additional aim: 8 of the 20 adolescents, and 4 professionals (1 activity instructor, 1 teacher of the deaf and 2 teaching support assistants).	Semi-structured interviews. Videos and field notes.	Inductive thematic analysis.	Sound quality and understanding of teacher.	- Coping without one. - Receiving unwanted attention. - Hassle. - Leaving friends to get their RM. - Interference. - User error (teachers and assistants). - Responsibility. - Difficulty in groups. PE: - Wind-noise - Fear of damage or loss. - Not allowed to use it. - Teacher loud enough. - Dangerous.
Wennergren (2008) (Sweden)	Qualitative.	To identify the choice of listening environment and listening strategies employed by students with hearing impairments.	165 students with hearing impairment and H/Aids. Age: 6-16 years old.	Drawing and explanation of the students' best listening environment. Follow-up conversations (65 students).	Pictures/written explanations: inductive thematic analysis Conversations to supplement pictures/written explanations.	—	Non-acceptance of hearing loss.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Facilitators	Barriers
Wheeler et al. (2007) (UK)	Qualitative.	To investigate the impact of CIs on adolescents with hearing impairments.	29 students with hearing impairment. Age: 13-17 years old. Male: 15; Female: 14.	Semi-structured interviews.	Inductive thematic analysis.	- Highly valued CI. - Dependent. - Helpful in class.	—
Woods (2020) USA	Qualitative.	To explore the cultural identity, practices and prevalence in hearing impaired adolescents in a mainstream school.	16 hearing impaired students. Years: 10-13. Male: 8; Female: 8.	Semi-structure interviews (7 were interviewed- 3 males and 4 females). Classroom observations, video diary of students' day-to-day school life, noting of artifacts/tools present in the culture.	Thematic analysis.	Dependent on RM.	—

Note. Where a study has not reported a facilitator or barrier, this is denoted in the table by the use of a dash "—".

Synthesis of Results

A number of common themes in relation to the facilitators and barriers of hearing device use were identified by the researcher across the studies for research question one. Themes regarding facilitators to using H/Aids, CIs and RM systems included the following, and are stated in order of commonality when examining across all the studies combined: "students' positive experiences during device use", "importance of the hearing device", "other", "physical fit of the hearing device" and "social".

Barriers to using H/Aids, CIs and RM systems were grouped under themes that included the following and are stated in order of commonality when examining across all the studies combined: "social", "students' negative experiences during hearing device use", "practicality of the hearing device", "perceived benefit of the hearing device" and "other". These themes are discussed in more detail in the following sections, grouped according to the type of equipment used.

Hearing Aid Use

Facilitators of Device Use

Multiple factors encouraging the use of H/Aids emerged across five studies and are discussed according to themes derived from the studies by the researcher. Themes are stated in order from most to least common for each hearing device.

"Importance of the Hearing Device"*[1]. Two studies reported students placing high value and realising the importance of their AC H/Aids in their everyday lives (Luckner & Muir, 2001; Morris, 2017). All students in the study by Morris (2017) who had AC H/Aids wore them at school consistently.

"Other"*. Some students felt normal having a hearing impairment, and thus were not deterred from wearing AC H/Aids (Kent & Smith, 2006). There was evidence to suggest that strong support networks may be influential in students' willingness to wear H/Aids, as Kent and Smith (2006) found this to be common among confident H/Aid users; Julie spoke of feeling normal because her friends were supportive of her: "They don't really mind if I'm wearing hearing aids or not." Additionally, students in Morris (2017) did not appear to feel anxious or have any concerns about wearing their H/Aids. One student from the study conducted by Kent and Smith (2006) liked attending social events for young hearing impaired people stating "Oh they're cool because I get to go on trips."

"Students' Positive Experiences During Hearing Device Use"[2].** H/Aids were reported to be helpful to students in class, as one student in Kent and Smith (2006) stated "'Cos they help me to hear just everything…" Additionally, one student in Elkayam and English (2003) mentioned her parents had always told her she was unique and special because of her hearing impairment, and wearing H/Aids, she felt, reinforced this.

"Physical Fit of the Hearing Device".** Students reported their H/Aids to be

[1] *Note*. "*" denotes themes that are equally as common within each group of hearing device.
[2] "**" is used to separate two sets of common themes, with "**" being less common than "*".

comfortable to wear, as well as discrete (Kent & Smith, 2006). As a student in Kent and Smith (2006) reported: "No-one can see them and they fit right inside your ear and they don't get sore on the outside."

"Social".** The study conducted by Israelite et al. (2002) discussed the importance placed by all participants on fitting in with their hearing peers. The students believed fitting in involved communicating like their hearing peers: "…we have to be normal…talk and act like hearing students." This would require wearing their H/Aids.

Barriers to Device Use

Numerous reasons regarding hearing impaired students' negative attitudes toward H/Aid use at school emerged across several studies.

"Social". AC H/Aids were reported to attract unwanted attention from others at school, with peers talking negatively about them and some asking questions that hearing impaired students did not like having to answer: "…I hate having to explain to people…they're [H/Aids] just like a hazard to me." (Elkayam & English, 2003). Some students had experienced bullying and issues relating to stigma as a result from wearing their H/Aids (Kent & Smith, 2006; Potts, 2014), whilst general education teachers felt some students were anxious about being bullied or embarrasssed due to wearing their H/Aids (Franks, 2008). Wanting to feel normal physically resulted in some students hiding their H/Aids by covering them with their hair, or refusing to wear them (Potts, 2014; Punch & Hyde, 2005). Some had issues relating to the cosmetics of their H/Aids: "I don't like it [H/Aid]. Too big and bulky. I want something smaller that no one would

notice" (Potts, 2014).

"Students' Negative Experiences During Hearing Device Use". AC H/Aids were physcially uncomfortable for some students to wear (Elkayam & English, 2003; Potts, 2014). A 14 year old in Potts (2014) suffered from many issues regarding the comfort of her ear moulds, thus resulting in being the main reason for the discontinutation of using her H/Aids. Other students in Potts (2014) commented on poor sound quality being a barrier to the use of their H/Aids: "When I put it in it just seems that everything is really loud like people screaming at me." Additional barriers to H/Aid use identified in this study included issues with feedback and hearing unwanted sounds, such as the wind or teachers' footsteps.

"Perceived Benefit of the Hearing Device". Students reported limited benefit from their AC H/Aids as being a deterrent to their regular use, with one student commenting "They don't help…" and another stating "I couldn't tell the difference" with regards to when they were or were not wearing their H/Aids (Potts, 2014). Additionally, students also reported that they felt their H/Aids did not give them back normal hearing (Elkayam & English, 2003).

Whilst it was speculated in Potts (2014) that there was a postivie relationship observed between severity of hearing loss and AC H/Aid use (the one participant who was interested in adopting their H/Aids again was the only one with a severe hearing impairment), this was confirmed in Elkayam and English (2003); there were reports of there being specifically less benefits for those with milder losses, as opposed to those with a more severe hearing impairment.

"Other". Dalton (2013) found that one student felt not wearing her AC H/Aids forced

her to work hard at school, and she appeared to be proud of this. Wennergren (2008) noted some students had not accepted their hearing loss, and therefore, decided not to wear their H/Aids with one 15 year-old student stating "I can hear everything without my hearing aids; there are only some hearing cells missing, I haven't used my aids for two years."

"Practicality of the Hearing Device". Some students worried about losing their AC H/Aids, as they were expensive (Elkayam & English, 2003).

Cochlear Implant Use

Facilitators of Device Use

Many facilitators were found throughout the literature when investigating CI use in adolescents with hearing impairment.

"Students' Positive Experiences During Hearing Device Use". Hilton et al. (2013) found students experienced an overall improvement in life, specifically in the areas of hearing, confidence, socilialisation and career prospects. One student in Kops (2003) and another in Wheeler et al. (2007) also reported being able to hear better. The student from Kops (2003) additionally reported improvements in their speech: "I like it…It's making my speech a lot better. I could talk when I had the hearing aids, but I can talk a lot better now than I could then. I'm listening a lot better." Improved independence at high school due to wearing a CI was stated by another student in Kops (2003). M. Park (2015) discovered one students' enjoyment of being able to hear more enviromental sounds, such as trucks and cars, despite the CI providing little benefit in terms of hearing speech. A second student in this study stated only needing to speak,

rather than to sign also or instead of speaking, as a benefit of having their CI. Additionally, students in this study saw their CIs as a way of preventing being bullied about not being able to hear their peers: “I didn’t had any implants on they will probably take the mickey out of me being deaf [sic].” Improved understanding in class was reported by some students in Wennergren (2008).

“Importance of the Hearing Device”. In three studies, CIs were reported to be valued by the students (Luckner & Muir, 2001; Morris, 2017; Wheeler et al., 2007). Students in the studies conducted by Luckner and Muir (2001) and Wheeler et al. (2007) disliked when their CIs were broken: “I hate it so much. Very frustrating because I can’t hear [sic].” Some were heavily dependent on their CIs in this study, with one student stating that they refused to attend school without their CI. All students in the study by Morris (2017) who had CIs wore them at school consistently.

“Social”. M. Park (2015) found that students wanted to be part of the hearing world and viewed wearing CIs as a way to do so. In this study, Eric’s mother held a strong view that all children who can have a CI should receive one and should not use sign language.

Barriers to Device Use

One barrier was found when analysing the studies in relation to CI use among hearing impaired adolescents.

"Social". Some students felt that having two CIs as opposed to just one further emphasised their hearing loss, as it was more visible being aided bilaterally: "What it affects me about having two is making it more obvious cos when I have my hair up it makes me more obvious…feels like I'm really alone [sic]" (Hilton et al., 2013).

Remote Microphone Use

Facilitators of Device Use

A handful of facilitators were found with regards to RM system use at school in hearing impaired adolescents.

"Students' Positive Experiences During Device Use"*. Students used RM systems during school time as this assistive listening device increased the quality and understanding of their teachers' voices during class (The Ear Foundation, 2014). One student stated "It amplifies what the teacher is saying so I can hear and then I can understand more better." Morris (2017) reported that 85% of students surveyed stated they benefited from its use.

"Importance of the Hearing Device"*. A student in Woods (2020) study was stated to be dependent on his RM system during class at his secondary school, as reported by the students' interpreter.

"Other"*. Another facilitator related to the length of time a student had used an RM system for; a student believed the longer one used an RM system, the more confident they would

be in doing so: “You are more confident if you had them [radio aid] for a long time [sic]” (Morris, 2017).

Barriers to Device Use

“Social”. Fear of being bullied, feeling embarrassed and receiving unwanted negative attention due to using an RM system led to students avoiding using this device (Dalton, 2013; Franks, 2008). The aversion to using the RM system with unfamiliar peers present was evident in some students, with one student stating “I don’t like handing the equipment [to the teacher] because I feel others are looking at me” (Morris, 2017). Other barriers to RM system use related to the students wanting to be perceived as normal, and that they did not view the RM system as contributing to this (Kent & Smith, 2006; Punch & Hyde, 2005). Kent and Smith (2006) reported a student stating that their RM receiver“…looks funny.”. One student in Kent and Smith (2006) noted her desire to be independent on and not having “…to rely on a microphone all the time.” Some students noted their annoyance at having to leave friends in order to collect the RM system (The Ear Foundation, 2014).

“Students’ Negative Experiences During Hearing Device Use”. Other hindrances related to the RM system producing poor sound quality (Morris, 2017; The Ear Foundation, 2014). Additionally, The Ear Foundation (2014) found that students experienced issues relating to the teachers and assistants not knowing how to use the RM system correctly, and listening difficulties in group situations due to not being able to hear their peers or other people talk in the background. For instance, one student reported “…I can only hear the teacher, and it quietens all

the other sound, so it is even harder to hear my friends" (The Ear Foundation, 2014). During Physical Education (PE), some students chose not to use their RM system due to wind-noise (The Ear Foundation, 2014).

"Practicality of the Hearing Device". Students also spoke of the burden regarding the responsibility of owning such a system (The Ear Foundation, 2014). Students from three studies noted the hassle of having to take the RM system to and retrieve it from each class during the school day (Kent & Smith, 2006; Morris, 2017; The Ear Foundation, 2014). One student stated "FMs are annoying- moving around from class to class giving them to the teacher" (Morris, 2017). Many students did not use the system during PE due to a number of reasons, such as wind-noise, fears among some students about losing or damaging the device, and it being dangerous to use (The Ear Foundation, 2014).

"Other". There were reports of students in PE not being allowed to use their RM system and the teacher being loud enough without one (The Ear Foundation, 2014). A general disliking of the RM system was reported in the study by Morris (2017): "I don't like wearing them at all [sic]".

"Perceived Benefit of the Hearing Device". Three studies reported students stating they did not use their RM system at school due to their perception of being able to cope without one (Kent & Smith, 2006; Morris, 2017; The Ear Foundation, 2014). One student noted her ability to cope without one, likely due to her being able to use communication strategies better: "Yeah, I used to wear it all the time at intermediate school, but at high school it's different. I

guess ‘cos I’m getting better…I know the point when I need to listen harden than other times” (Kent & Smith, 2006).

Summary

16 sources, including those of qualitative and mixed-methods design, were included in the study investiagting facilitators and barriers to the use of hearing devices in hearing impaired adolescents. All studies were critically appraised.

Five themes were discovered in relation to the facilitators of the use of hearing devices among hearing impaired adolescents. These themes include: “importance of the hearing device”, “other”, “students’ positive experience during hearing device use”, “physical fit of the hearing device” and “social”. Barriers to hearing impaired adolescents’ use of hearing devices were grouped under the following five themes: “social”, “students’ negative experiences during hearing device use”, “perceived benefit of the hearing device”, “other” and “practicality of the hearing device”.

Chapter 5. Results for Research Question Two

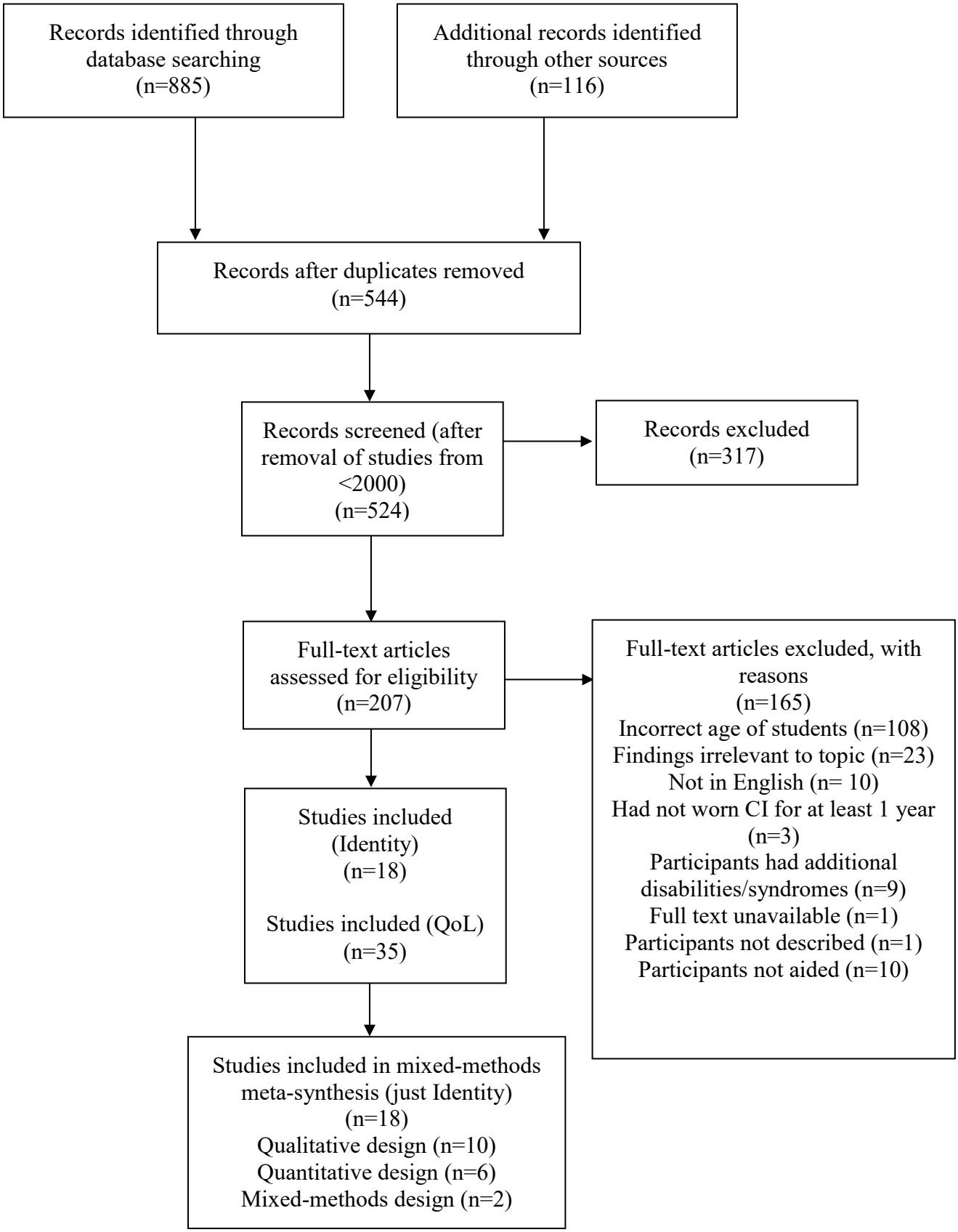
Included in this chapter are details regarding the process for including the selected sources for research question two. Additionally, the results from the critical appraisal and synthesis of these sources for this question will be discussed.

Selection of Sources of Evidence

The following display depicts a flow diagram of the identification of relevant sources in the search process for research question two, using the PRISMA flow diagram template adapted from Moher et al. (2009).

Figure 2

PRISMA Flow-Diagram for Q2



Due to the evidently larger volume of literature on the topic of QoL as compared to cultural identity after completing the search, it was decided that only literature on cutural identity would be investigated due to time constraints as a result of the change from the study's origninal intentions. 18 sources including the topic of cultural identity of hearing impaired adolescent students were included in the final number. Of these sources, six were qualitative, six quantitative and two were of mixed-methods design.

Critical Appraisal Within Sources of Evidence

The results from the critical appraisal of all sources included in research question two are displayed in the following tables. Table 7 depicts the results from qualitative studies, Table 8 displays the results from quantiative studies and Table 9 shows the mixed-methods studies' results.

Table 7

Critical Appraisal Results for Qualitative Studies (Q2)

Study	Q1	Q2	Q3	Q4	Q5	Total (/10)	Comments
Dalton (2013)	2	2	2	2	2	10	
Dixon et al. (2004)	2	1	2	2	2	9	Q2: form of data not mentioned.
Hardy (2010)	2	2	2	2	2	10	
Hilton et al. (2013)	2	1	2	2	2	9	Q2: form of data not mentioned.
Israelite et al. (2002)	2	2	2	2	2	10	
Kent & Smith, 2006)	2	2	2	2	2	10	
Kops (2003)	2	2	2	2	2	10	
M. Park (2015)	2	2	2	2	2	10	
Wheeler et al. (2007)	2	2	2	2	2	10	
Woods (2020)	2	2	2	2	2	10	

Table 8

Critical Appraisal Results for Quantitative (Descriptive) Studies (Q2)

Study	Q1	Q2	Q3	Q4	Q5	Total (/10)	Comments
Kent (2003)	2	1	1	0 ("cannot tell")	2	6	Q2: not mentioned if some did not participate and why. Q3: reliability and validity not reported for questionnaire. Q4: not mentioned if some did not participate and why.
Mance & Edwards (2012)	2	1	2	0 ("cannot tell")	2	7	Q2: not mentioned if some did not participate and why. Q4: not mentioned if some did not participate and why.
Moog et al. (2011)	2	1	1	0 ("cannot tell")	2	6	Q2: inclusion/exclusion criteria not mentioned or why 72 students did not participate. Q3: reliability and validity of scale not reported Q4: no justification for non-participation.
Most et al. (2007)	2	1	1	0 ("cannot tell")	1	5	Q2: inclusion/exclusion criteria not mentioned or if some did not participate and why. Q3: validity of scale not reported. Q4: no mention if people did not participate and why. Q5: ANOVA test not justified.
Sari (2005)	2	2	1	2	2	9	Q3: validity of scale not reported.
Wald & Knutson (2000)	2	1	1	0 ("cannot tell")	2	6	Q2: inclusion/exclusion criteria not mentioned or if some did not participate and why. Q3: reliability and validity of scale and form not reported. Q4: no mention if people did not participate and why and why some did not answer scale.

Table 9

Critical Appraisal Results for Mixed-Methods Studies (Q2)

Study	Section	Q1	Q2	Q3	Q4	Q5	Total (/10)	Grand total (/30)	Comments
Elkayam & English (2003)	Qualitative.	2	2	2	2	2	10	28	
	Quantitative (descriptive).	2	2	1	2	2	9		Q3: reliability for self-assessments not reported.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.
Morris (2017)	Qualitative.	2	2	2	2	2	10	25	
	Quantitative (descriptive).	2	1	2	0 "cannot tell"	1	6		Q2: not mentioned if some did not participate and why. Q4: not mentioned if some did not participate and why. Q5: analyses not clear or justified for questionnaire.
	Mixed-method.	2	2	2	2	1	9		Q5: study did not score full marks in the quantitative section.

Qualitative Studies

Regarding research question two, qualitative studies rated highly overall for their quality, with overall scores ranging from "9" to "10/10". Scores for question two were "1" for two studies (Dixon et al., 2004; Hilton et al., 2013). Not mentioning the form of the data collected was the reason for this score in these studies.

Quantitative Studies

Overall scores for the quantitative sources ranged from "5" to "9/10". Three out of the six studies' overall scores were "6/10" (Kent, 2003; Moog et al., 2011; Wald & Knutson, 2000). Five out of the six studies scored "0" for question four, with most not mentioning if participants did not participate and reasons for this (Kent, 2003; Mance & Edwards, 2012; Moog et al., 2011; Most et al., 2007; Wald & Knutson, 2000).

Five out of the six studies scored "1" for question two, with the exception of Sari (2005) which scored "2". Most of these five studies failed to clearly mention the inclusion and exclusion criteria adopted for their participants, and if some of the participants did not participate as well as justification for non-participation. Regarding question three, five out of the six studies scored "1" because the reliability and/or validity of the measures used in the studies was not reported. However, Mance and Edwards (2012) scored 2 for this question. Five out of the six studies scored "2" for question five, with Most et al. (2007) scoring "1" due to not providing justification for the statistical test used. All studies scored "2" for question one as the sampling strategies used were relevant to address the research questions of interest.

Mixed-Methods Studies

Grand total quality rating scores for these mixed-methods studies ranged from “25” to “28/30”.

Qualitative Section. All mixed-methods studies scored “10/10” for the qualitiative section of the studies.

Quantitative Section. Morris (2017) scored “1” for question two due to not stating if participants chose not to participate and reasons for this. One out of the two studies also only scored “1” for question three, with Elkayam and English (2003) not reporting reliability for the self-assessments used in their study.

In regards to question four, Morris (2017) received a score of “0” due to not reporting if some chose to not participate or stating the reasons some participants withdrew from the study. Only Morris (2017) scored “1” for question five, with the other study received a full score. The analyses used in the study by Morris (2017) were neither clear nor justified.

Both studies scored “2” for question one, as having a mixed-methods design was deemed appropriate for these studies in order to answer their research questions. Total scores for the quantitative section of these studies ranged from “6” to “9/10”.

Mixed-Methods Section. Both studies scored “2” for questions one, two, three and four for the mixed-methods section. Scores for question five were “1” for both studies, due to none of the studies gaining perfect scores for the qualitative and/or quantitative sections. Total scores for the mixed-methods portion were “9/10” across both studies.

Characteristics and Results of Individual Sources of Evidence

Methods used to conduct these studies included interviews (unstrctured and semi-structured), questionnaires, scales, repertory grids, academic and psychological results. Inductive thematic analysis, grounded theory analysis, constant comparative analysis, interpretative phenemenological analysis, interaction analysis and statisical analyses (including Spearman's rho (ρ), one-way ANOVA, Bonferino test, Pearson correlation, *t*-tests, mean, range, comparisons) were used to analyse the results. The studies' origin, design, aim, participant description, data collection, data analysis and findings relating cultural identity are reported in Table 10. Other findings not relevant to research question two from these studies are summarised and reported in Appendix C.

Table 10

Findings From Relevant Sources (Q2)

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Identity
Dalton (2013) (Canada)	Qualitative.	To investigate students with mild or moderate hearing loss' experiences. To look particularly at how the students coped at school, as well as their views of their hearing loss. Additionally, to provide recommendations for educators and researchers around participation of these students.	3 students. 18 (female), 20 (female) and 21 (male) years old.	Interview (type not specified).	Inductive thematic analysis.	1 participant: hard-of-hearing. Did not think of hearing loss as disability.
Dixon et al. (2004) (UK)	Qualitative.	To investigate the relationships between hearing impaired and hearing adolescents in a mainstream school.	44 students at secondary school (12 hearing impaired who were Years 7-11. Hearing students were Years 7-10). 6 parents of hearing impaired students, 4 mainstream teachers, 6 specialist staff, 2 mainstream managers, lunchtime supervisor, governor and an educational welfare officer.	Semi-structured interview.	Grounded theory analysis.	Some wanted to fit in with hearing peers.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Identity
Elkayam and English (2003) (USA)	Mixed methods.	To modify and examine the effects of self-assessment/significant other questionnaires (which explore the emotional, communicative and social impacts of hearing loss) on the counselling of adolescents with hearing impairment.	15 adolescents with hearing loss (originally 20 (Male: 12; Female; 8. Age 12-18 years old)). 15 significant others (SOs) who were normal-hearing peers of these adolescents with hearing impairment.	Questionnaires. Rating Scales. Informational/personal adjustment counselling. Follow-up survey.	Questionnaires: correlation between the subjects' and their significant others' responses was investigated. Interviews: inductive thematic analysis. Follow-up survey: descriptive statistics e.g. mean, range of responses.	- Difficulties determining identity. - Dislike of being only hearing impaired student.
Hardy (2010) (UK)	Quantitative (descriptive).	To investigate the awareness of hearing impaired adolescents in the development of their deaf identity.	11 adolescents with hearing impairment. Age: 13-16 years old. Male: 5; Female: 6.	Semi-structured interview.	Grounded theory, with constant comparative method.	- 2: wanted to be treated as normal. - 1 did not mind being hearing and deaf. - 1 felt hearing and deaf.
Hilton et al. (2013) (UK)	Qualitative.	To assess the outcomes of adolescents who have received a sequential CI after having had just one CI for numerous years. To provide insight to those (parents/children) considering unilateral, bilateral or sequential CI.	11 adolescents with hearing impairment. Age: 12-18 years old. Male: 4; Female: 7.	Semi-structured interview.	Interpretative phenomenological analysis.	- Most felt between hearing and deaf. - Most felt more similar to hearing people - Fluid identity. - Students liked fitting in. - Viewed being in the hearing world as important. - Most students wanted to be viewed as normal. - Some did not feel disabled.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Identity
Israelite et al. (2002) (Canada)	Qualitative.	To examine the construction of identity in hearing impaired adolescents.	7 adolescents with hearing impairment. Age: 14-17 years old.	Interviews (one open-ended and one semi-structured). Questionnaire.	Inductive thematic analysis with constant comparative method.	Strong identification as HOH.
Kent and Smith (2006) (NZ)	Qualitative.	To explore the perceptions of hearing impaired adolescents who use H/Aids.	16 adolescents with hearing impairment in mainstream education. Age: 12-17 years old.	Unstructured interviews.	Inductive thematic analysis.	- Many felt HOH. - Confident wearers felt normal.
Kent (2003) (NZ)	Quantitative (descriptive).	To investigate identity issues in and compare health behaviours of adolescents with hearing impairment to adolescents with normal hearing in mainstream schools.	52 adolescents with hearing impairment. Age: 11-15 years old. Male: 55.8%; Female: 44.2%. 470 adolescents with normal hearing. Age: 11-15. Male: 50.9%; Female: 49.1%.	Questionnaire.	Descriptive statistics e.g. means, standard deviations etc.	Many did not feel they had a disability.
Kops (2003) (USA)	Qualitative.	To assess the experiences of hearing impaired adolescents with CIs.	6 hearing impaired adolescents with CIs. Age: 14-18 years. Male: 6; Female: 2.	Semi-structured interview.	Constant comparative method.	- Identity formed by personal characteristics. - Minimal exposure to/interest in Deaf community

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Identity
Mance and Edwards (2012) (UK)	Quantitative (descriptive).	To investigate the self-perceptions and psychological well-being of hearing impaired adolescents with CIs.	22 hearing impaired adolescents with CIs. Age: 12-18 years. Male: 9; Female: 14 (one of the participants was unable to complete the repertory grid due to psychological issues).	Self-perception: Repertory grid. Psychological wellbeing: Beck Youth Inventory questionnaires.	Pearson's correlations and Spearman's rho (ρ).	- Most identified as either hearing or deaf oral. - Some identified as Deaf signing.
Moog et al. (2011) (USA)	Quantitative (descriptive).	To explore the psychosocial characteristics of adolescents with long-term CI use.	121 hearing impaired adolescents with CI. Age: 15-18.6 years. 46 normal hearing adolescents. Age: unknown	Questionnaires. Rating scale. Reading comprehension test.	Unclear.	Most identified as bicultural, followed by hearing, then Deaf.
Morris (2017) (UK)	Mixed-methods.	To investigate the reasons as to the use and non-use of RM systems at mainstream schools, specifically the influence of self-esteem, in adolescents with hearing impairments.	20 adolescents with hearing impairments. Male: 10; Female: 10.	Questionnaire. Rating scale. Structured interview.	Unclear.	Most identified as HI, followed by Deaf and HOH.
Most et al. (2007) (Israel)	Quantitative (descriptive).	To assess the association between identity and attitudes toward CI and in hearing impaired adolescents.	115 hearing impaired adolescents. Age: 14-20 years old. Male: 55; Female: 60.	Questionnaire. Rating scale.	Statistical analyses e.g. one-way ANOVA, Bonferoni test and Pearson correlation.	- Most felt bicultural, followed by hearing, then Deaf. - Minority felt marginal.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Identity
M. Park (2015) (USA)	Mixed-methods.	To gain further understanding into the educational needs of children with CIs. To investigate whether the students' school programs meeting the five tenets of the Whole Child Initiative (Association for Supervision and Curriculum Development [ASCD], 2013)	6 participants (5-22 years old).	Semi-structured interviews. IEPs, report cards, standardized testing results and psychological reports. Academic work examples, classroom observations.	Interaction analysis (for direct observations and interviews) to see social interaction patterns. Inductive thematic analysis.	- 1: mixed feelings, stated deaf and HOH. - 1: HOH, strong parental influence. - 1: Deaf
Sari (2005) (Turkey)	Quantitative (descriptive).	To investigate the identity and communication modes in hearing impaired adolescents.	90 hearing impaired adolescents. Age: 4-18 years. Male: 67; Female: 23.	Rating scale.	Descriptive statistics e.g. percentages.	- Predominant bicultural identity. - Some felt Deaf. - Minority felt hearing.
Wald and Knutson (2000) (USA)	Quantitative (descriptive).	To examine the cultural identity of and relationship between social competence and deaf identity in hearing impaired adolescents with and without CIs.	45 hearing impaired adolescents with and without CIs. Age: 12-18years old. Male: 32; Female: 13. Teachers of these hearing impaired adolescents.	Rating scale. Teacher rating form.	Statistical analyses e.g. *t*-tests and correlational analysis.	Bicultural identity.
Wheeler et al. (2007) (UK)	Qualitative.	To investigate the impact of CIs on adolescents with hearing impairments.	29 students with HI. Age: 13-17 years old. Male: 15; Female: 14.	Semi-structured interviews.	Inductive thematic analysis.	- Most identified as deaf or HOH. - Some felt in between deaf and hearing. - Minority felt hearing.

Study	Study type	Objective/aim	Participants	Data collection	Data analysis	Identity
Woods (2020) USA	Qualitative.	To explore the cultural identity, practices and prevalence in hearing impaired adolescents in a mainstream school.	16 hearing impaired students. Years: 10-13. Male: 8; Female: 8.	Semi-structure interviews (7 were interviewed- 3 males and 4 females). Classroom observations, video diary of students' day-to-day school life, noting of artifacts/tools present in the culture.	Thematic analysis.	- 1: Deaf - 1: hard-of-hearing and deaf.

Synthesis of Results

A range of results were found across the studies, with the following descriptors reported to describe a range of students' identity: "Deaf", "deaf", "deaf-oral", "deaf-signing", "hard-of-hearing", "bicultural", "hearing", "marginal", "deaf-oral" and "deaf-signing". Some described their cultural identity in relation to disability, whilst others were unsure of their cultural identity. Others reported identity with regards to fluidity. These descriptors were determined as themes for the cultural identity of adolescents with hearing impairments who use H/Aids or CIs.

Bi-Cultural Identity

Students stated they had a bicultural identity in eight out of the 17 sources selected (Hardy, 2010; Hilton et al., 2013; Moog et al., 2011; Most et al., 2007; M. Park, 2015; Sari, 2005; Wald & Knutson, 2000; Wheeler et al., 2007). Students talked about feeling between the two hearing and deaf worlds, with one student stating "Sometimes I feel like I'm hearing, sometimes I feel like I'm deaf." (Wheeler et al., 2007). Identifying as being between hearing and Deaf cultures was evident in 56.7% of students in the study conducted by Sari (2005). 37% of students in Moog et al. (2011) identified as between both the hearing and Deaf worlds. Dixon et al. (2004) reported students trying to blend in or compensate for their hearing loss due to the pressure of fitting in. One student in this study became isolated, due to avoiding hearing impaired peers out of fear of being identified as hearing impaired, and also avoiding hearing peers due to fear of being bullied because of her hearing loss. Distinctions were made between deaf and Deaf identities; although many students in Hilton et al. (2013) felt they were "bicultural", they only felt part of the deaf world and did not identify as culturally Deaf. Those in

Most et al. (2007) who used both spoken and signed language identified as closer to being bicultural.

Hearing Identity

Having a hearing, or normal, identity was described by students across many of the studies, with ten studies reporting such findings (Hardy, 2010; Hilton et al., 2013; Israelite et al., 2002; Kent & Smith, 2006; Kops, 2003; Mance & Edwards, 2012; Moog et al., 2011; Most et al., 2007; Sari, 2005; Wheeler et al., 2007). 33% identified as "hearing" in the study by Moog et al. (2011). Most students in Mance and Edwards (2012) identified as either "hearing" or "deaf-oral". Most et al. (2007) showed identifying as "hearing" was the second most common identification group selected by the students, with "bicultural" being the first and "Deaf" being the last. A minority of those in the studies by Wheeler et al. (2007) and Sari (2005) chose "hearing" as their identity, with a student stating "To be honest inside me I'd say I'm hearing because I can hear what everyone is saying."One student in Hilton et al. (2013) felt more fully "hearing" after receving their sequential CI; they did not feel completely "hearing" with one CI as they reported their other ear was still "deaf". 10% of participants in Sari (2005)'s study identified as culturally "hearing". Those who were confident in using their H/Aids identified themselves as "normal" (Kent & Smith, 2006). Students in the study conducted by Kops (2003) defined their identity based on their capabilites and personal characteristics; they did not define themselves in relation to their CI or hearing loss. Students liked being able to fit in because of their CIs, according to Hilton et al. (2013).

Whilst some students wanted to be treated like their hearing peers, one student also stated they felt anxious when they sometimes could not understand others (Hardy, 2010). Another

student in Hardy (2010) did not want to associate with deaf people and felt embarrassed when others communciated with him in a way that would not be done with his hearing peers e.g. having an adult sign to him. There were reports of some students not wanting to contact or not necessarily being aware of the Deaf community (Hilton et al., 2013; Israelite et al., 2002; Kops, 2003). Sign language was not used by many students in Hilton et al. (2013), and was viewed as a means of excluding themselves from those who are hearing. Those in Most et al. (2007) whose primary language was oral associated more with the hearing world.

Hard-of-Hearing Identity

Israelite et al. (2002) reported all adolescent students to strongly identify as "hard-of-hearing", and this was influenced by experiences with their teachers, hard-of-hearing peers and school in general. Most students identified as "hard-of-hearing" in Kent and Smith (2006), but made it clear they did not identify with the stereotypes they mentioned about "hard-of-hearing" people, such as deformed facial features.

Most students in Wheeler et al. (2007) felt either "hard-of-hearing" or "deaf", whilst one out of the three adolescents in the study by M. Park (2015) strongly viewed themselves as "hard-of-hearing". This student's mother discouraged him from learning sign language or learning about and being involved in the Deaf community. Less than a third of students in Morris (2017)'s study "felt hard-of-hearing". Brooke, who was a participant in Dalton (2013), identified as "hard-of-hearing", stating she saw herself as different from her hearing peers, though she felt as capable as her hearing peers, even though some of her teachers did not believe so. She felt shame with her hearing loss and experienced feelings of isolation as a result of her hearing impairment.

Deaf Identity

Some students felt part of the Deaf community. This was reported in four studies (Moog et al., 2011; Morris, 2017; Most et al., 2007; M. Park, 2015). Approximately just over one third of the participants in the study by Morris (2017) identified as "Deaf". 33.% in Sari (2005), 30% in Moog et al. (2011), a minority in Most et al. (2007) and one out of three adolescent students in the study by M. Park (2015) identified as "Deaf". One out of the two students who used a CI in the study by Woods (2020) identified proudly as being Deaf: "My identity is I am proud to be Deaf…"

deaf Identity

Approximately 50% of the students in the study conducted by Hilton et al. (2013) identified that they were "deaf", valuing sign language and their deaf friends. Most students who participated in Wheeler et al. (2007) felt either "deaf" or "hard-of-hearing"; a minority felt strongly "deaf". One participant stated that they felt "partially deaf" in they study by Morris (2017). Hilton et al. (2013) reported five participants felt they looked more "deaf" after receiving a sequential CI, with one other student feeling more "deaf" due to their belief having a sequential CI made it look like they needed more help from a hearing perspective.

Marginal Identity

A minority of students in Most et al. (2007) identified as being "marginal", feeling they belong to neither the hearing nor the Deaf worlds.

deaf-Oral or deaf-Signing Identities

Mance and Edwards (2012) spoke of "deaf-oral" and "deaf-signing" identities in some students. Identifying as "deaf-oral" or "hearing" was most common, with students still likely to identify as "deaf-signing", but not as much as the previous two categories.

Hearing Impaired Identity

Morris (2017) reported half of the students as describing themselves as "hearing impaired".

Disability Identity

Three studies reported students discussing their hearing impairment in relation to disability. 55.8% students in Kent (2003) did not view their hearing loss as a being disability. Hilton et al. (2013) found that some did not view having a hearing loss as meaning they were disabled. One student in this study saw their hearing loss as a disability that could be fixed by having CIs. One student in Dalton (2013) did not view herself as having a disability.

Unclear Identity

Some students had difficulties in determining their identity. Hilton et al. (2013) reported one student felt more and less "deaf" at the same time, due to being able to hear better, but also felt as though they stood out more physically due to the addtion of a second CI. Students in Elkayam and English (2003) did not feel clear about what they identified as. M. Park (2015) revealed one student who appeared to have mixed feelings about their identity, stating that they felt "deaf, but later in their interview reported they feel hearing when they wear their CI. For one student in the study conducted by Woods (2020), despite them stating "I feel like I'm really

hard-of-hearing…", they also proceeded to exclaim "…but I'm really myself deaf because I can't hear, but I can use speech and I can hear with (gestures to CI) [sic]".

Fluid Identity

Identity was reported to be a fluid concept, changing overtime and with different environments (Hilton et al., 2013; Israelite et al., 2002). Identity appeared to change as a function of differing commuciation modes, peer groups, or in situations where there were difficulties communicating with others (Hilton et al., 2013).

Summary

18 sources, including those of qualitative, quantitative and mixed-methods designs, were included in the study investigating the cultural identity of hearing impaired adolescents with amplification. All studies were critically appraised.

The following cultural identities were reported across the included sources: "bicultural", "heairng", "hard-of-hearing", "Deaf", "deaf", "marginal", "deaf-oral", "deaf-signing" and "hearing impaired". Some viewed their hearing loss as a disability and others were unsure of their identity. Identity appeared to be a fluid concept for some students.

Chapter 6. Discussion

A number of findings emerged from this study across both research questions. These are discussed according to their corresponding research question and referenced in relation to the literature review in the introduction. A summary of the critical appraisal results for both research questions is presented. The clinical implications, study implications and future study directions are also discussed.

The first research question was to identify the facilitators and barriers to the use of AC and BC H/Aids, CIs and RM systems at school amongst the adolescent population, in addition to the facilitators and barriers of their teachers' use of their RM system at school.

Facilitators of Device Use

Many facilitators to the use of AC H/Aids and RMs were found. Themes for AC H/Aids regarding facilitators included "importance of the hearing device", "other", "students' positive experiences during device use", "physical fit of the device" and "social" aspects. Themes of facilitators to CI use included "students' positive experiences during device use", "importance of the hearing device", and "social" aspects. However, only three themes were identified with regards to the use of RM systems, due to the lack of available literature. These included "importance of the hearing device", "students' positive experiences during device use", and "other". Common themes found across hearing devices that related to the facilitation of these devices include "students' positive experiences during hearing device use" and "importance of the hearing device" It is clear from this that students viewing their hearing device as important and students having positive experiences associated with their device potentially play a crucial role in their use of these devices at school. As this was found across the studies, this points to the

necessity of ensuring students enjoy and gain benefit from their devices. However, it is important that students perceive their devices to be of benefit themselves, rather than this being reported objectively to them.

"Students' Positive Experiences During Device Use". Positive experiences gained from using hearing devices appeared to be a prominent theme found across studies regarding the facilitation of using AC H/Aids, CIs and RM systems. Students comments specifically centred around their AC H/Aids being helpful and adding to their individuality (Elkayam & English, 2003; Kent & Smith, 2006), whilst those using CIs appreciated the overall benefits these devices provided to their lives, which included improved independence, access to environmental sounds, the ability to use only one communication method, prevention of bullying and increased ability relating to hearing and speaking (Hilton et al., 2013; Kops, 2003; H. Park, 2015; Wheeler et al., 2007). Improvement in overall life, more specifically independence, is consistent with previous literature investigating adults' experiences with CIs (Hallberg & Ringdahl, 2004; Harris et al., 1995). Those with RM systems found their device improved the sound quality and their understanding of their school teachers (The Ear Foundation, 2014).

Interestingly, the findings from Barker (2020) regarding facilitation of the use of RM systems were not reflected in the literature found in this review. Perhaps this is due to a lack of research regarding the use of RM systems in secondary school with hearing impaired adolescents and their teachers. Whilst these findings from Barker (2020) were derived from primary school children and their teachers, it is possible that they transfer to the secondary school setting, as the findings did not appear to be dependent on the age of the children, and these facilitators could be relevant to the setting of a secondary school.

"Importance of the Hearing Device". Students' hearing devices being viewed as important was a common theme identified across the studies in facilitating the use of different devices used. Students being reliant on their hearing devices was evident across many studies, with AC H/Aids, CIs and RM systems all reported to be relied on (Wheeler et al., 2007; Woods, 2020). In addition, many students valued these devices and viewed them as important (Luckner & Muir, 2001; Morris, 2017; Wheeler et al., 2007). Clearly, this was an important factor contributing to students' use of these devices; the benefit from using them was viewed as high by these students. Literature conducted on the general population regarding the use of H/Aids complements these findings as adults have been shown to use their H/Aids due to having a positive attitude about them (Brooks, 1989; Hickson et al., 2014; Wilson & Stephens, 2003). Additionally, this study's findings in this areas is consistent with the findings from Barker (2020) relating to hearing impaired students and their teachers viewing these devices as important and in a positive light. However, it was not found in previous literature on the general population whether there were facilitators relating to CIs being viewed as important.

"Other". There were a few studies that had findings unique to their research regarding the facilitators of hearing device use in this population. The facilitators of students viewing themselves as "normal" and having a strong support network were only reported by Kent and Smith (2006). This was only associated with students who wore AC H/Aids. These findings appear to be consistent with those discussed previously in Hickson et al. (2014) and Aberdeen and Fereiro (2014), whereby those hearing impaired in the older population who use H/Aids were more inclined to use them if they felt normal doing so and if they received support from others. This brings to light the importance of how people across different ages view themselves whilst using their hearing devices, in addition to how their use does not necessarily depend on

the person themselves, but on others providing sufficient support. Clearly, for some students, a strong support network, which includes others such as family and professionals working with these adolescents, is a fundamental part of their success regarding using their device. Not being an anxious wearer of H/Aids and having used an RM system for a longer period of time were facilitators in the use of these devices only found in Morris (2017). Literature with these findings, however, were not discovered in a review of the facilitators of these devices in the general population.

"Social". It is clear that some students with hearing impairment wanted to be like their hearing peers with regards to communication abilities, and saw the hearing world as being important to be part of. Students saw their hearing device as a means of achieving these desires, and this was reported in two of the 16 studies found in this research (Hilton et al., 2013; Israelite et al., 2002). However, this was only in studies where students had AC H/Aids or CIs. These views were also not found in the literature on facilitators to the use of hearing devices in the general population. Thus, it is possible that these findings are specific to the adolescent population.

Only students who used AC H/Aids reported specifically the social benefits associated with using this hearing device, and this was reported in just one study: Kent and Smith (2006). Social benefits described in Kent and Smith (2006) were not reported in the literature on the general population with hearing impairment and who have AC H/Aids, or any other hearing device.

"Physical Fit of the Hearing Device". With regards to the physical fit of the hearing device, only one study reported on this being a facilitator: Kent and Smith (2006). They found that students reported their AC H/Aids to be comfortable and discrete. This finding was only referenced in relation to students who wore H/Aids and no other hearing devices, and this was not found to be discussed from the perspective of facilitating use in the review of literature regarding the general population with AC or BC H/Aids, CIs or RM systems. Whilst this appears to be only a minor finding in this study, it still could be considered as important in facilitating the use of hearing devices.

Barriers to Device Use

Multiple barriers to the use of AC H/Aids and RMs were found across the reviewed literature in the adolescent population. "Social", "student's negative experiences during device use", "perceived benefit of the hearing device", "other" and "practicality of the hearing device" were identified as themes to the deterrent of AC H/Aid use. Regarding the use of CIs, only one barrier was found to their use when examining the literature: "social" aspects. However, this was in reference to the addition of a CI implant when the student already had one, therefore they may have felt ok with wearing and using just one CI. There were many barriers to the use of RMs across the literature, and identified themes include the following: "social", "students' negative experiences during hearing device use", "practicality of the hearing device", "other" and "perceived benefit of the hearing device". There were common themes across these studies, with "social" reasons being the most common, followed by "students' negative experiences during hearing device use", indicating that being and feeling accepted and part of society was important to many students, in addition to the devices being required to work well for their needs.

"Social". The theme "social" was a strong commonality, and found across nine out of the 16 studies. Many students reported wanting to fit in with hearing peers, experienced bullying, embarrassment, stigma, unwanted attention and a desire to be independent (Dalton, 2013; Elkayam & English, 2003; Franks, 2008; Hilton et al., 2013; Kent & Smith, 2006; Morris, 2017; Potts, 2014; Punch & Hyde, 2005; The Ear Foundation, 2014). This was a clear barrier to hearing device use that was identified in the literature, encompassing AC H/Aids, CIs and RM systems. This finding is to be expected due to heightened self-esteem issues and desire to fit in and not stand out during adolescence. This finding is consistent with what was found in the literature with regards to adult AC H/Aid users, whereby stigma was identified as a barrier to the use of H/Aids in adults (Kochkin, 2000, 2007). However, this contradicts Morris (2017) as there was no evidence found to suggest these students in a mainstream school felt stigmatised wearing their AC H/Aids; they were reported to feel neither concerned nor anxious about using them. This opposes what one might expect regarding stigmatisation of H/Aids being an issue especially in the adolescent population. This, therefore, displays and reinforces the idea that although adolescents experience the same developmental stages during this period in life, they are still heterogeneous and must be treated as such (Hornsby, 2004; Kiff & Bond, 2008; Punch & Hyde, 2005).

The findings that many students were embarrassed, disliked unwanted attention drawn to them, wanted to fit in with their hearing peers and be treated normally was evident across most of the studies examined which reported on the use of AC H/Aids, CIs or RMs. The embarrassment associated with using AC H/Aids is consistent with the literature that has been found which investigated reasons for non-use of AC H/Aids among older adults (Kochkin, 2000; Ritter et al., 2020; Tomita et al., 2001). However, it is also evident from the findings regarding

facilitators to the use of hearing devices that many students also viewed their hearing equipment as important. Whilst some students may be able to overcome the social issues related to wearing hearing devices due to viewing their devices as more important, the importance of hearing devices may not be enough to outweigh these challenges for other students. As discussed in Punch and Hyde (2005), difficulties arise when adolescent students desire to be treated normally, but also recognise the need for support regarding their hearing. This may create a dilemma in which students may feel conflicted and end up sacrificing their access to sound due to perceived and observed societal pressures associated with trying to fit in with peers (Gustafson et al., 2015). One the one hand, there may be hearing impaired students who are unhappy and experience psychological distress from being singled out in an effort by professionals to assist them. Conversely, there may also be students whose desire to be treated normally reaches the point where they are not given the help or have accommodations made for in terms of communication strategies they might need in order to do as well as their peers with normal hearing. Students were reported to say they felt anxious sometimes when they could not understand others, even though they wanted to be treated normally like their hearing peers (Hardy, 2010).

Interestingly, it became clear that students viewed fitting in with their peers in two different ways in relation to use of their AC H/Aids: Israelite et al. (2002) found that some students saw wearing their H/Aids as a way of fitting in with their peers due to their aids allowing them to communicate like their peers. In contrast, some students in the study by Punch and Hyde (2005) were more concerned about fitting in physically, believing that wearing their AC H/Aids made them look different from their peers. This raises the issue of how one might interpret the concept of “fitting in” and what value an individual places on certain aspects of this.

Concerns regarding the cosmetics of hearing devices were found in one study in which students wore AC H/Aids (Potts, 2014) and this was consistent with the literature regarding cosmetic concerns being a barrier to the use of AC H/Aids among adults (Driscoll & Chenoweth, 2007; Gianopoulos et al., 2002), suggesting that this is also a prevalent issue in the adolescent population. This is expected due to the feelings of self-consciousness that emerge during this period in life (Somerville et al., 2013).

Additionally, the findings relating to the social aspect of using an RM in this study were also found to be consistent with previous literature, whereby primary-school students in Barker (2020) also experienced issues relating to self-esteem and wanting to fit in with their peers with regards to their RM system.

Despite previous literature reporting issues in the adult population with self-esteem and visibility around wearing a BC H/Aid (Dutt et al., 2002), studies on the barriers to usage in adolescents with this technology with respect to social aspects were not reported.

"Students' Negative Experiences During Hearing Device Use". Whilst none of the studies reported barriers to the use of BC aids or CIs with regards to this theme, it was commonly found across many of the studies looked at in the literature for AC H/Aids and RM systems; two of these studies cited poor sound quality as a deterrent to their use (Morris, 2017; Potts, 2014). These findings were consistent with literature conducted on the older population (Bertoli et al., 2009; Kochkin, 2000). Whilst poor sound quality acted as a barrier to RM system use for participants in Morris (2017), interestingly those in students in the study conducted by The Ear Foundation (2014) found the opposite. Thus, there is an inconsistency in these studies in this area, suggesting the complexities of the heterogeneous nature of hearing impaired

adolescents and potentially the quality of and user ability of this technology. Elkayam and English (2003) and Potts (2014) both found physical discomfort of AC H/Aids was an evident issue for some students, reducing their success with using their H/Aids. The other findings within this theme were unique to specific studies.

The issues regarding H/Aids feeding back and amplifying background noise (Potts, 2014) were found to be consistent with previous literature on the adult population (Bertoli et al., 2009; Kochkin, 2000, 2007; Masters, 2016; Tomita et al., 2001). In addition to this discomfort, poor physical fit of the device presented as a barrier to the use of H/Aids in two of the studies found (Elkayam & English, 2003; Potts, 2014), and was also found to be a prevalent issue across multiple studies for some adults who owned AC H/Aids (Bertoli et al., 2009; Cohen-Mansfield & Taylor, 2004; Gianopoulos et al., 2002; Kochkin, 2000, 2007; Masters, 2016; Öberg et al., 2012; Ritter et al., 2020; Tomita et al., 2001).

Issues regarding feedback were only prevalent in one study that looked at the use of AC H/Aids (Potts, 2014), however these were found to be a barrier to the use of H/Aids amongst the older population with hearing impairment in six studies (Gianopoulos et al., 2002; Hartley et al., 2010; Kochkin, 2000, 2007; Masters, 2016; Tomita et al., 2001). Whilst it is promising to see that AC H/Aids are likely being fitted with appropriate measures to avoid feedback issues in the adolescent population because issues regarding feedback only emerged in one study, this is potentially still an issue for some adolescents due to this study being conducted recently.

"Perceived Benefit of the Hearing Device". The study by Potts (2014) was the only one to report on students stating the little overall benefit that they experienced when using their AC H/Aids. This was consistent with literature conducted on the older population, and was evident

across multiple studies (Aberdeen & Fereiro, 2014; Bertoli et al., 2009; Gianopoulos et al., 2002; Gopinath et al., 2011; Kochkin, 2000; Lupsakko et al., 2005; Masters, 2016; Öberg et al., 2012; Ritter et al., 2020; Tomita et al., 2001). Less benefit with regards to milder hearing loss was found only in one study (Elkayam & English, 2003), but was consistent with previous literature conducted in children and adult populations (Dammeyer et al., 2017)

AC H/Aids being viewed as not a cure by students who have them was found in two of the 16 studies (Dalton, 2013; Elkayam & English, 2003). This is consistent with Kochkin (2007) who also reported the same findings from their study conducted in adults. The finding of some students being able to cope without their AC H/Aids (Kent & Smith, 2006) was also consistent with literature on older populations (Bertoli et al., 2009; Kochkin, 2000; Lupsakko et al., 2005; Öberg et al., 2012; Ritter et al., 2020; Tomita et al., 2001). Some students who also used RM systems reported being able to manage without one at school (The Ear Foundation, 2014), however this was not found in the background literature discussed previously. Barriers to the use of BC H/Aids and CIs in adolescents were not revealed in regards to this theme in any of the studies included in this research.

"Practicality of the Hearing Device". Whilst this theme was not found in students who used BC H/Aids or CIs, there were findings relating to the use of AC H/Aids and RM systems. Issues with regards to the practicality of devices was only found when adolescents were using RM systems and AC H/Aids in this study, as opposed to CIs or BC H/Aids. The findings in this study related to issues around responsibility and dangers associated with using the RM during PE (The Ear Foundation, 2014). Additionally the RM was viewed as being a hassle in two studies (Morris, 2017; The Ear Foundation, 2014). The only consistent finding with the previous

literature related to fear of damaging or losing the RM system (The Ear Foundation, 2014): teachers in Barker (2020) were also fearful of damaging the RM which meant that there were some instances in which it was not used. The RM being viewed as an inconvenience was also evident in the study by Barker (2020), however in this case it was related to issues with connecting to students' AC H/Aids and with charging the device, as opposed to the issues with the student having to hand the RM to and collect it from different teachers throughout the day. This issue was only found evident in the present study when looking at the literature relating to the adolescent population, most likely due to the fact that high school students have multiple teachers throughout the day, whereas primary school students typically are taught by just one teacher, thus eliminating the need to hand the RM to different teachers within one day. There is a possibility that the hassle reported by students of retrieving and passing on their RM system is related rather to a social issue and conceals their true feelings about their RM.

Regarding AC H/Aids, students in Elkayam and English (2003) also stated they were easy to lose, which was consistent with findings from Masters (2016), whereby adult AC H/Aid owners would not wear their H/Aids in certain situations, such as fishing, for fear of losing them. Whilst it is important to be aware of and cautious about damaging or losing hearing devices, it is as equally important to recognise this within reason and, where possible, not let this become an unnecessary obstacle to using hearing devices where they are needed.

"Other". A handful of barriers related to the theme "other" were found in the use of AC H/Aids, as well as RM systems, but not in those with BC H/Aids or CIs. Non-acceptance of hearing loss was found to be prevalent in some adolescents (Wennergren, 2008), thus leading to poor use of AC H/Aids. Previous literature has found that acceptance of hearing loss leads to

more consistent use of AC H/Aids (Brooks, 1989; Jerram & Purdy, 2001). This is likely due to the clients consequently accepting H/Aids as a means of rehabilitating their hearing loss; greater acceptance of their hearing loss results in an increased likelihood of H/Aid use (Masters, 2016). One student viewed wearing H/Aids as a deterrent to her working as hard as she could (Dalton, 2013), however this finding was not found in the search of previous literature.

RM systems were not used in PE due to not being allowed to use it and the teacher being loud enough, and some students were also reported to generally dislike their RM (The Ear Foundation, 2014). These were unique findings not found in previous literature, thus highlighting the heterogeneous nature of the adolescent population.

Cultural Identity

The second research question examined the cultural identity of hearing impaired adolescents who used hearing devices. Many labels were used by adolescent students who use H/Aids or CIs to describe their cultural identity in relation to hearing, as is evident in the literature in this study. These labels to describe their identity include the following: “bicultural”, “hearing”, “hard-of-hearing”, “Deaf”, “deaf”, “marginal”, “deaf oral”, “deaf signing” and “hearing impaired”. This mix of identities, excluding “deaf signing” and “deaf oral”, was also found to be prevalent across studies in previous literature in adults and adolescents (who did not meet this study’s criteria) (Bat-Chava, 2000; Chapman & Dammeyer, 2017; Cole & Edelmann, 1991; Leigh, 1999; Maxwell-McCaw & Zea, 2011; McIlroy & Storbeck, 2011; Preisler, Tvingstedt, & Ahlström, 2005). Whilst McIlroy and Storbeck (2011) stated one participant had a CI and the rest had H/Aids and some had CIs in Chapman and Dammeyer (2017), it was unclear

in the remaining studies conducted in the older population as to whether participants were aided and what type of hearing device they used.

Despite many labels being used to describe adolescents who have hearing impairments, the predominant cultural identity adolescents across the studies used to describe themselves as was “bicultural”, whereby students felt between both the hearing and deaf or Deaf worlds. Interestingly, most of those previously mentioned in the literature conducted on adults and adolescents with hearing impairment also identified predominantly as “bicultural”. However, only in one of these studies was the term “deaf” instead of “Deaf” mentioned in reference to the term “bicultural”, thus making it unclear whether they meant participants were part of the Deaf world specifically. It was evident that this finding regarding a prevalence of biculturalism in this study was consistent with literature on older populations and adolescents with hearing loss. It is clear, therefore, the heterogeneous nature of this population. However, it is evident that there were mixed results across the literature in this study, indicating and reinforcing the notion that no two individuals are alike and although may have experienced similar things in the past, they do not share the exact same journeys.

A point to note that emerged from this literature was that identity is not a fixed, stagnant concept, but rather fluid in nature, continually re-shaping and changing as one develops and is exposed to new experiences (Hilton et al., 2013; Israelite et al., 2002). This notion was also reflected in other literature not part of this study, as discussed previously (Breivik, 2005; Leigh, 1999; McIlroy & Storbeck, 2011). Some students appeared to be unsure of their identity; this was found across more than one study, which further emphasises the fluid nature of identity (Elkayam & English, 2003; Hilton et al., 2013; M. Park, 2015; Woods, 2020). In particular, adolescence is a period of change; for instance, typically friendships change as adolescents are

navigating their way through this time in their life and finding who they truly fit in with (Brown & Larson, 2009; Giordano, 2003). Therefore, whilst what was reported by students in relation to their cultural identity was what they felt at the time, there is a possibility that this identity may change and flow between different identities as they progress through secondary school and develop further, beginning their journey into adulthood and beyond.

As stated by Kemmery and Compton (2014), a fluidity in identity can be thought of as an identity in itself. However, the idea of labelling students according to their identity may not be necessarily helpful; there is a possibility that this could be contributing to the stigmatisation of hearing loss. Dangers are associated with labelling others that can result in stereotyping and, therefore, remove the "person" out of the equation. As a result, there is a risk of their disability being a defining factor in their cultural identity, rather than it simply being a part of them (Rix, 2006). Additionally, Beeghly (2015) and Leigh (2009) highlight the concern of labelling potentially leading to the simplification and misrepresentation of those that have been labelled. Although a student in Dalton (2013) identified as "hard-of-hearing" and felt different from her peers, she believed she was as capable as her peers, but some of her teachers did not. Thus, this example highlights the detrimental effects of being stereotyped, as discussed previously.

In addition to these findings, some participants described their cultural identity in relation to disability (Dalton, 2013; Hilton et al., 2013; Kent, 2003), with most students stating they did not see their hearing loss as a disability. Watson (2002) found in a study of 28 adults with disabilities that many did not view their disability as defining themselves; participants felt that they were normal, as their disability was simply a part of their everyday life and, to them, was not different. Only three participants in this study viewed their disability as part of their cultural identity. On the other hand, it was found that students in Bat-Chava (2000)'s study who were

raised in a speaking household were more likely to view their hearing loss as a disability, which indicates the possibility of the person's environment influencing how they view themselves in terms of their cultural identity. As Leigh (2009) discussed, parents can have an impact on their child's cultural identity; hearing impaired children with hearing parents are likely to identify as "hearing", at least initially, and children of Deaf parents who teach their children ways to interact with the hearing world so that they are comfortable in it may lead to these children identifying as "bicultural".

As was evident in Kops (2003), students did not define themselves by their hearing loss or CI, but rather by their personal characteristics. Therefore, it is important to be aware that not all students may like to identify themselves in relation to their hearing loss. Conversely, there may also be students who like to identify regarding their hearing loss and feel proud to do so, such was in the case of a CI user in Woods (2020). Thus, the label "Deaf" may be important to those in this community as it is associated with a strong feeling of identity towards this world. Clearly, this is a complex subject in which there are multiple views and no 'correct' way of how one wishes to identify, whether that be in relation to their hearing loss or not.

Summary

There were numerous findings that resulted from conducting the mixed-methods meta-syntheses. These are summarised in accordance with their corresponding research question below.

Research Question One

Although through the study of this literature it is evident that the adolescent population is heterogeneous, there still appears to be commonalities in themes found across the majority of the studies regarding facilitators and barriers to the use of hearing devices. Facilitators focus on students' positive experiences with using their devices, whilst barriers appear to be attributable mainly to social reasons.

Findings in the general population with regard to facilitators of using AC H/Aids centred more around accepting one's hearing loss, whereas in the adolescent population, it appears that students having positive experiences with their AC H/Aids is one of the main facilitators driving the use of these devices. This may be due to these students growing up with their hearing loss, and, therefore, already accepting it, whereas the studies investigating the general population included adults and the elderly; some of these people had acquired their hearing loss. Therefore, accepting their hearing loss was part of their journey to using their H/Aids.

In regards to the barriers to the use of hearing devices, whilst a lot of the findings from the study were consistent with literature previously conducted in older populations, it is clear that barriers to their use appear to be attributable to mainly social reasons. This highlights and overlaps with the work of Erikson (1964), stressing the turbulent times that adolescence encompasses, during which one is more conscious of wanting to fit in with society and their peers and avoid appearing different. However, it has emerged through this study that the facilitators and barriers reported can be interchangeable; interestingly, when students viewed their devices from a communicative perspective, it was evident that some saw their devices as a means of being able to fit in with their peers and, thus, this acted as a facilitator to their use. In contrast, others viewed them from a visual perspective, seeing them as a way of making them

stand out from others, and, therefore, did not want to use their devices. An additional example of this interchangeability is that whilst some students were motivated to use their hearing devices due to them being comfortable, others found them uncomfortable, thus contributing to them not wanting to wear them.

Some findings from the studies on the adolescent population were not found in previous literature regarding the general population and vice-versa. Whilst this may be attributable to the difference in age of participants, this may simply be due to the fact that there is a lack of literature in academia that warrants further investigation.

There were no findings across any of the studies investigated in the adolescent population that related to facilitators or barriers to the use of BC H/Aids and only one barrier was identified in relation to the use of CIs. This may be due to BC H/Aids and CIs typically being more part of the medical world, as bone-anchored H/Aids and CIs involve surgery. Perhaps, therefore, students with these are given more attention from a habilitation viewpoint and generally experience success with their devices. Additionally, there were no findings relating to the facilitators and barriers to the use of RMs by teachers of audiologically aided adolescents with hearing loss.

Research Question Two

There was a mix of identities evident amongst adolescent hearing impaired students in the findings of this study. Therefore, this emphasises that no two hearing impaired adolescent students are alike, further supporting the notion that the adolescent population is heterogeneous. Whilst Glickman and Carey (1993) would argue that the reflection of differing identities within this study's findings are due to students being in different stages in the development of their

identity, this is not necessarily the case. There was, however, a predominance of students associating as “bicultural”. As was reported in a few studies, the nature of identity appears to be fluid and not necessarily constrained to specific stages of development. Previous literature conducted on the general population with H/Aids is in agreement with these findings.

Critical Appraisal Summary

The quality scores from the critical appraisal of the literature in this study indicated that the quality of qualitative studies and qualitative sections of mixed-methods studies was high overall, therefore these studies can be viewed as quality sources that provide insight into the facilitators and barriers to AC H/Aid, CI and RM system use in hearing impaired adolescents, and their cultural identity. However, quantitative studies and those mixed-methods studies with quantitative parts did not score as highly. Many of these studies failed to report whether participants chose not to participate and reasons why, in addition to their inclusion/exclusion criteria, meaning it is unknown in some studies if some did not participate for common reasons, thus creating a non-response bias. Some studies did not state the validity or reliability of their measures or justify their statistical analyses used. As a result, these studies or sections of studies are not as of high quality as the qualitative studies and qualitative sections of the mixed-methods studies. Therefore, they should be viewed and interpreted with caution, as should the findings of this review because of this. It is, therefore, evident that there is a lack of quality quantitative and mixed-methods studies conducted in this area of research.

Limitations

Due to the limited number of participants in each study, generalisations to the population reviewed in this study should be cautiously made. Additionally, this review has reinforced the notion of adolescents being a heterogeneous population; whilst some findings may appear to be consistent across the studies found in this search, these should not be assumed to apply to all in this population studied.

There is a possibility that the predominant use of interviews across the qualitative and mixed-methods studies may have resulted in bias in the participants' responses. Participants not knowing the interviewer or knowing them prior to the interview could have resulted in opinions being withheld or skewed due to lack of rapport or out of fear of facing consequences, despite participants knowing their interview was confidential. This is particularly something that might occur within the adolescent population due to a general increase in self-consciousness in this period in life (Somerville et al., 2013). Therefore, it is important to note that not all opinions given by participants are necessarily complete or reflect participants' true feelings.

There is a possibility that some potential sources may have been missed, despite using five databases to conduct the search. The researcher employed the 'citation snowballing' method and carefully looked at and double-checked all references in the reference lists of included studies for this review. However, studies that the researcher read the full-text of but then were excluded did not have their reference lists checked. Additionally, due to qualitative filters being applied to databases, in the instances where the data sets were large, also meant that some relevant quantitative sources may have been missed that could have contributed to this study's findings. However, it is expected that these relevant sources should have been cited by the included articles in this study and, thus, found during the 'citation snowballing' process.

There may be interpretation bias regarding the results as only the researcher was involved in this step of the study; the interpretation of data and extraction of themes is somewhat subjective, shaped by the knowledge, beliefs and experiences of the one conducting this part of research (Palinkas, 2014; Walsham, 2006). A lack of experience on the researcher's behalf and the fact that the critical analysis of the studies in this review was only done by the researcher may mean that there would be discrepancies between the researcher's results and those of an academic who has more experience with critically rating studies. Thus, the results from the critical analysis should be approached with caution.

The original intent of this study was to investigate the experiences, including facilitators and barriers, of hearing impaired adolescents and their teachers' use of RM systems at school in New Zealand. The ethics application was submitted and approved. However, due to a lack of interest in participating in the study and the limited time left in which to complete this thesis, it was decided in November that a review of the literature would be done instead. Despite participants being offered a video instead of in-person interview due to COVID-19, there was still a lack of interest regarding participating in this study. This may have been in part due to the effects of COVID-19 on potential participants meaning the study was not a priority for them, and also possible anxieties/dislikes of this population around the thought of doing an interview with an unfamiliar person.

Clinical Implications

Facilitators found in this review regarding the use of hearing devices can be used to help guide professionals working with hearing impaired students with devices and their parents/caregivers around how to ensure the successful use of these devices. It is evident that the

social aspect of wearing hearing devices is important to adolescents, as this was a clear barrier to their use that was identified in this study. Therefore, this should be considered when working with adolescents with hearing devices, and those working with this population, such as audiologists, RTDs, teachers and so forth, should be aware of this. As mentioned previously, there are numerous negative consequences of not using hearing devices; it is important for hearing impaired adolescents with hearing devices to use them consistently, particularly at school if they are educated orally, otherwise they risk falling behind, potentially jeopardising their schooling. This could have implications for their career and adulthood. For professionals working with these students, such as teachers and audiologists, it is important to acknowledge these social issues and address them or refer to appropriate services where necessary.

A concern involves the different teaching and learning contexts of high school compared to primary schools. Typical secondary school education involves students interacting with multiple teachers during the day as they progress from class-to-class. The successful use of hearing devices, particularly RM systems in this context, relies partly on all teachers having positive rapport with students in order to provide a supportive environment in which they can use such devices. Being aware of hearing impaired students' needs and their devices, particularly RM systems as these are to be used with cooperation from the students' teachers, is an important step in ensuring success for these students at secondary school. Teachers should ensure they build positive rapport with all students in the class, especially those who are hearing impaired, and help to normalise their hearing devices so that students might not feel embarrassed or experience bullying as a result of using them.

Accommodations, such as being able to sit closer to the teacher and clear views of the teachers' mouth whilst they are speaking, should be made for these students where necessary in

the classroom in order to help them get the maximal benefit out of using their hearing devices. However, as is evident from the findings of this study, the dilemma arises when students wish to be treated as their fellow hearing peers so as to fit in with them and not be viewed as different because of their hearing loss, yet also recognise the need for and want people to use communication strategies when speaking to them. Therefore, a balance must be achieved between providing ample support, but not singling the student out. As adolescents are all unique and, thus, will have their own preferences, how to achieve this balance should be discussed between the student and teachers and other professionals working with them. Additionally, school counsellors should be available and approachable to support these students in order to help them work through any psychological barriers that may arise with regards to the use of these systems.

Audiologists should be aware of the challenges adolescents might face in using their hearing devices at school and realise that, as was evident in the findings of this study, the main barrier to some students' successful use of their hearing devices might be more psychologically rooted. Therefore, answers regarding these students' experiences using their hearing devices may not reflect their true feelings, but rather may be a cover-up of what they really feel. Whilst giving explanations and showing objective test results regarding the benefit of students' hearing devices is still an important factor to ensuring the use of these devices, this may not be sufficient in itself to facilitate their use; for some, barriers to hearing device usage could be more due to psychological challenges that need to be addressed.

It is clear from the findings of this study that simply educating hearing impaired students around the benefits of their hearing devices does not guarantee device use at school. Audiologists, therefore, should at least attempt to gently reveal the root of the issue, rather than

take what is said at face-value, in order to understand the reasons behind students' actions. Honest and open discussions should be strived for between audiologists, students and their parents/caregivers so the student can be understood so as to help them succeed and feel happy at school. The ability to build rapport successfully with these students will be crucial in being able to get to the bottom of any issues regarding the use of hearing devices at school. Rapport building is a skill that is essential to building trust and respect with clients, allowing them to feel able to open up to their clinician in a supportive environment, without fear of being judged (Bakić-Mirić & Bakić, 2008). Audiologists working with adolescents with hearing impairment should look to adopt and ensure a client-centred approach at all times, which involves working with these students, to aid in the building of rapport. This is as opposed to a clinician-centred approach, whereby less emphasis and importance would be placed on these students' views regarding their hearing devices (Grenness et al., 2014; Rogers, 1951).

However these discussions must be done within the scope of practice of audiology and referral to a psychologist should be made where necessary. Despite efforts that should be made to destigmatise hearing loss in schools and the wider community, these students may, in addition, still face bullying. Additionally, those who, for instance, naturally have a more anxious predisposition, when coupled with the social pressures of adolescence and stigmatisation regarding their hearing loss, may be more at risk and need further support. Thus, knowing when it might be appropriate to suggest counselling to help the student through psychological and social challenges is essential to assist in the continuous use of hearing devices and wellbeing of adolescents with hearing impairment.

Additionally, some findings, including issues with feedback and physical fit of the device, which acted as barriers to the use of hearing devices in adolescents are able to be fixed

by audiologists. Therefore, audiologists should ensure they are proactive in their provision of their services; these issues should be detected early on or as soon as possible and remedied quickly so as not to deter students from using their hearing devices; during this time, there is the potential for students to already be less inclined to want to wear them to due social reasons, therefore the addition of these fixable issues that are neglected may result in the critical point at which students' refuse to wear their hearing devices. After this point has been reached, even if issues that are able to be fixed have been remedied, more effort may be required by professionals to help students become consistent wearers of their devices again, and students may start experiencing difficulties with learning in class, leading to them falling behind.

On the contrary, professionals working with adolescents with hearing loss must be aware that the use of hearing devices is not necessarily the only way to enhance communication; education around effective communication strategies, examples of which have been discussed previously, and discovering what strategies hearing impaired adolescents are already adopting and employing in their day-to-day school lives can aid in ensuring the student is able to communicate effectively with others and thrive at school.

Regarding research question two, it is clear that there was a mix of identities among adolescent hearing impaired students in the findings of this study. Therefore, this emphasises that no two hearing impaired adolescent students are alike, further supporting the notion that the adolescent population is heterogeneous. Whilst Glickman and Carey (1993) would argue that the reflection of differing identities within this study's findings are due to students being in different stages in the development of their identity, this is not necessarily the case. As was reported in a few studies and as was consistent with other literature, the nature of identity appears to be fluid and not necessarily constrained to specific stages of development. Thus, it is important for

teachers, audiologists and others working with hearing impaired students to be aware that students will be different from one another with regards to their cultural identity. Additionally, people working with these students should also be aware that their identity could very well change during the time in which they are working with them. Therefore, this may lead to new feelings as time passes about their hearing devices and present with new challenges regarding facilitating their use at school. Ensuring the use of these students' devices is discussed regularly with hearing impaired students with their audiologists, parents and others working with them will help to identify when such barriers to their use might be starting to occur, if they have not already. As a result, these barriers can be addressed earlier rather than later, which will help to avoid habits beginning of not using their hearing devices.

Future Research Directions

Due to the lack of literature identified in this review regarding facilitators and barriers to the use of RM systems in secondary schools by teachers of hearing impaired adolescents, this is an area that would benefit from further research to fill in this void. Teachers are crucial in helping to ensure students' success at secondary school. It would be interesting to see if the results from Barker (2020) were consistent with the experiences of secondary school teachers, and what potential supports may be needed in order to help facilitate their use in the classroom; it would be of particular use to investigate this in the context of the additional challenges having multiple teachers might bring regarding different personalities (approachableness, willingness to help students and so on), experiences with students with hearing impairment and RM system use, and so forth. These issues need to be made known so that they can be addressed in order to help ensure hearing impaired students are fully supported and can do their best at school. As

mentioned previously, the original intention of this study examining hearing impaired aided-adolescents and their teachers' experiences of using an RM system in New Zealand secondary schools was not able to come to fruition due to a lack of participants. There is a current lack of literature in this area, with no such study conducted on this population in New Zealand, and the monetary cost of these devices is high. Therefore, this study should be conducted in order to better understand the experiences of hearing impaired adolescents and their teachers' use of RM systems in New Zealand and these populations' needs so that their experiences can be improved.

Future studies should look to investigate the experiences of adolescents wearing BC H/Aids in secondary schools regarding facilitators and barriers to their use, as this was not found this review of the literature from the past 20 years. It is important to include these populations in future research as, in many cases, they have had surgery to be able to wear their device and the device is more expensive than AC H/Aids, so if students are not using them consistently at school, reasons why should be investigated in order to better support these students. Further research should be done investigating whether further barriers exist to the consistent use of CIs at school, seeing as only one emerged and the commitment to and cost of a CI is high. These students are just as important as those with H/Aids and, therefore, should not be neglected in this area of research.

More studies should look to investigate the experiences of aided-hearing impaired adolescents and their teachers' use of other assistive listening devices, such as classroom amplification systems, and comparisons could be conducted between experiences with different systems e.g. RM systems vs classroom amplification systems. If students and teachers are not using these devices, reasons for this need to be known in order to help guide support to these students and teachers and design of future devices. Knowing facilitators to their use also can help

in the case where hearing impaired students and their teachers are not using this equipment that they have access to as this can also help further regarding knowing what helps to ensure the use of these devices and how to maximise these effects. There is scope for more global representation to be achieved in research investigating facilitators and barriers to the use of these devices to see if there are any differences from country to country wherein there are different cultures and beliefs. It would be interesting to see if there are instances of hearing impaired students and their teachers not using their devices based on cultural and/or religious beliefs.

An area that calls for further exploration is the complications that can occur when professionals working with people with hearing impairment attempt to ensure the real reasons for the non-use of hearing devices are uncovered. This could potentially be more of an issue in the adolescent population which may be less forthright and trusting due to the changes experienced in this period of life. It would be interesting to see how much adolescents attempt to hide their true feelings about their hearing devices, and whether effective counselling strategies employed by professionals working with this population, such as audiologists, can assist in the revealing of their underlying feelings toward their devices. Studies in the future could focus on investigating the effects of client-centred practice and rapport building, or lack thereof, by audiologists on this population. This could provide more insight into what strategies work best with those in this population in order to help them in their journey with their amplification.

Additionally, studies should look to investigate the strategies employed by students who do not use their amplification or use it inconsistently in order to gain insight into how these students manage in school environments and what they would need to be changed in order to wear their devices consistently. Whether these students feel their needs in the classroom are

currently being met and if they feel they require additional support could also be examined to guide the provision of services to these student.

Further research should be done on these topics in these populations in general, due to low numbers of participants in studies found and low currently available research conducted in these areas. Studies conducted in the future could look to examine these topics in those with additional disabilities, and a review could be conducted on this population with regards to these areas of research. Further barriers identified in future studies regarding the use of hearing devices can assist in the improving the development of hearing devices to ensure the best experience possible for this population, which will contribute to helping them get the most out of their schooling experience and set them on a path with no limits that will help them achieve their goals in life.

Research could be done exploring further the notion of cultural identity in adolescents, and how this might relate to the type of hearing device used and amount of use in order to gain greater perspective into potential facilitators and barriers to their use. In addition to this, how the terms found to describe the cultural identities of hearing impaired students could be investigated regarding how these are determined, and the definitions of these labels could be contrasted with those of normal hearing people to see how each side views these. This could provide further insight into societal and individual views of cultural identity. These relationships were not able to be investigated during this study due to time constraints.

Investigating whether correlations exist between types of educational environments, such as mainstream schools, units for deaf/hard-of-hearing students within mainstream schools and schools for the deaf/hard-of-hearing adolescents attend and so forth, and use of their hearing devices. In addition, identifying whether there are correlations between cultural identity and use

of hearing devices could be done. This would assist in providing more insight into potential facilitators/barriers to hearing device use.

A systematic review could be conducted to look at the quantitative literature specifically on these two topics on this topic; some relevant literature may have been missed in the revision of this topic due to the use of qualitative filters in the search strategy. However, as the decision was made to subsequently include any relevant quantitative studies found through the search process, the 'citation snowballing' process should have resulted in all relevant quantitative studies being included. Therefore, this hopefully would have ensured the capture of any missing quantitative studies that may not have been found through simply the search strategies used. Due to the broad scope of QoL and the substantial number of studies identified investigating this factor among adolescents with hearing devices, this should look to be reviewed as a subsequent study. This will help to direct the future designs and provisions of services of these devices to ensure the best experiences and QoL for hearing impaired adolescent students

Conclusion

Facilitators and barriers to the use of hearing devices in the hearing impaired adolescent population have been investigated in this study. It is evident that although a range of themes have been identified, students viewing their devices as important were the most prominent facilitator to their device use. Conversely, the conspicuous barrier to hearing device use among hearing impaired students was related to social aspects. Studies neither reported on facilitators and/or barriers to the use of BC H/Aids in this population, nor teachers' (of hearing impaired adolescent students) experiences with RM systems. Cultural identity of hearing impaired adolescents was also explored in the literature; a mix of identities across the studies was discovered, with many students describing themselves bicultural (between the deaf or Deaf and hearing worlds). However, these findings were not true for all students in the included studies; this highlights the diversity found within the hearing impaired adolescent population, despite a shared stage of development in life. There is scope for future research and reviews to be done in these areas in order to better understand reasons for the non-use of hearing devices among this population and their teachers, and what facilitators might help those to use these hearing devices. Investigating further about the identities of hearing impaired adolescents may assist in widening people's perspectives and aid in the provision of appropriate services. The results from this study provide insight for those working with hearing impaired adolescents about hearing device use and cultural identity; this will help to ensure that these students can flourish, maximise their learning and be better supported during secondary school, which will assist in the creation of a strong foundation for the journey into adulthood.

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Appendix A. Search Strategies Used for Research Question One

Search Engine	Search Strategy
Ovid (EMBASE)	1. hearing aid/ or exp air conduction hearing aid/ or assistive listening device/ or exp bone conduction hearing aid/ or exp cochlea prosthesis/ or digital hearing aid/ or hearing aid accessory/ or wireless air conduction hearing aid/ 2. ((hearing or listening) adj2 (device* or aid*)).ti,ab. 3. (remote microphone* or FM system* or RM system*).ti,ab. 4. cochlear implant*.ti,ab. 5. 1 or 2 or 3 or 4 6. ((school* or classroom* or pupil* or student* or educat*) adj10 (secondary or high or teen* or adolesc* or youth*)).ti,ab. 7. ((parent* or mother* or father* or caregiver* or guardian* or teacher*) adj10 (child* or teen* or adolesc* or youth* or student* or pupil*)).ti,ab. 8. 6 or 7 9. 5 and 8 10. (interview* or qualitative or experience* or attitude*).ti,ab. 11. exp health care organization/ 12. 10 or 11 13. 9 and 12
Cochrane	((parent* OR mother* OR father* OR caregiver* OR guardian* OR teacher*) NEAR (child* OR teen* OR adolesc* OR youth* OR student* OR pupil*) OR (school* OR classroom* OR pupil* OR student* OR educat*) NEAR (secondary OR high OR teen* OR adolesc* OR youth*)) i AND (hearing OR listening) NEAR (device* OR aid*) OR ("cochlear implant" OR "cochlear prosthe*" OR "remote microphone*" OR "FM system*" OR "RM system*")
PsycINFO	S1. (parent* OR mother* OR father* OR caregiver* OR guardian* OR teacher*) N10 (child* OR teen* OR adolesc* OR youth* OR student* OR pupil*) S2. (school* OR classroom* OR pupil* OR student* OR educat*) N10 (secondary OR high OR teen* OR adolesc* OR youth*) S3. S1 OR S2 S4. ((hearing OR listening) N2 (device* OR aid*) OR (cochlear implant* OR cochlear prosthes*)) S5. ("remote microphone*" OR "FM system*" OR "RM system*") S6. S4 OR S5 S7. (interview* OR qualitative OR experience* OR attitude*) S8. S3 AND S6 AND S7

Search Engine	Search Strategy
Scopus	(((TITLE-ABS-KEY ((interview* OR qualitative OR experience* OR attitude*)) AND TITLE-ABS-KEY (((hearing OR listening) W/2 (device* OR aid*) OR ("Cochlear implant*" OR "cochlear prosthe*" OR "remote microphone*" OR "FM system*" OR "RM system*"))))) AND ((TITLE-ABS-KEY (((school* OR classroom* OR pupil* OR student* OR educat*) W/10 (secondary OR high OR teen* OR adolesc* OR youth*))) OR TITLE-ABS-KEY (((parent* OR mother* OR father* OR caregiver* OR guardian* OR teacher*) W/10 (child* OR teen* OR adolesc* OR youth* OR student* OR pupil*)))))

Appendix B. Search Strategies Used for Research Question Two

Search Engine	Search Strategy
Ovid (EMBASE)	1. Hearing Aid/ 2. Cochlea Prosthesis/ 3. cochlear implant*.ti,ab. 4. ((hearing or listening) adj2 (device* or aid*)).ti,ab. 5. 1 or 2 or 3 or 4 6. "Quality of Life"/ 7. ("quality of life" or "well being" or "well-being" or "life satisfaction").ti,ab. 8. Social Identification/ 9. ("body image" or "self-esteem" or "self-image" or "body dissatisfaction").mp. 10. ("Group Identity" or "Social Identity" or "Ego Identity" or "Cultural Identity" or "Self-Concept").mp. 11. 6 or 7 or 8 or 9 or 10 12. 5 and 11 13. limit 12 to adolescent <13 to 17 years>
Cochrane	cochlear implant* OR ((hearing or listening) near/2 (device* or aid*)) in Title Abstract Keyword AND "quality of life" OR "well being" OR "well-being" OR "life satisfaction" OR "body image" or "self-esteem" or "self-image" or "body dissatisfaction" OR "Group Identity" or "Social Identity" or "Ego Identity" or "Cultural Identity" or "Self-Concept" in Title Abstract Keyword AND adoles* OR teen* OR youth* in Title Abstract Keyword
PsycINFO	S1. (school* OR classroom* OR pupil* OR student* OR educat*) N10 (secondary OR high OR teen* OR adolesc* OR youth*) S2. SU high school students S3. S1 OR S2 S4. (hearing or listening) N2 (device* or aid*) S5. cochlear implant* S6. DE "Hearing Aids" S7. DE "Cochlear Implants" S8. S4 OR S5 OR S6 OR S7 S9. S3 AND S8 S10. DE "Quality of Life" OR DE "Health Related Quality of Life" OR DE "Quality of Life Measures" S11. "quality of life" or "well being" or "well-being" or "life satisfaction" S12. "Group Identity" OR DE "Social Identity" OR DE "Ego Identity" OR DE "Cultural Identity" OR DE "Self-Concept" S13. body image or self-esteem or self-image or body dissatisfaction S14. S10 OR S11 OR S12 OR S13 S15. S9 AND S14s

Search Engine	Search Strategy
Scopus	((TITLE-ABS-KEY ((school* OR classroom* OR pupil* OR student* OR educat*) W/10 (secondary OR high OR teen* OR adolesc* OR youth*))) AND ((TITLE-ABS-KEY ((hearing OR listening) W/2 (device* OR aid*))) OR (TITLE-ABS-KEY (cochlear AND implant*)))) AND (("Quality of life" OR "well being" OR "well-being" OR "life satisfaction" OR "self esteem" OR "self concept" OR "self identity" OR "social identity" OR "ego identity") OR ("body image" OR "self-esteem" OR "self-image" OR "body dissatisfaction"))

Appendix C. Other Findings From Included Studies

Study	Other Findings
Dalton (2013)	- Students needed their peers and teachers to understand their hearing impairment so that they could form rapport with them. - Importance of teachers ensuring they cater to mild/moderate hearing impaired students' listening, communication and social-emotional needs was stressed. Positive experiences made them feel empowered and motivated in class.
Elkayam & English (2003)	- Students felt isolated. - Some students were concerned about asking for repetition and did not want to annoy others/be judged. - Strategies such as using assistive listening devices and using notetakers were used to problem-solve difficult learning environments. Students often asked for repetitions in class, reluctantly. - Some blamed their difficulties with communication on others, or convinced themselves their hearing difficulties did not annoy them. - Most wanted to have normal hearing, but some began to accept their hearing loss. Students realised they would miss out hearing things sometimes. - Students learnt new information about their hearing loss from participating in the study. 80% benefited from the counselling sessions.
Franks (2008)	- Many reasons given for non-usage of RM system (students not of adolescent age), such as relating to wanting to fit in with their peers, not seeing the benefit in their RM system and it being inconvenient etc. - Type of hearing loss not predictor of reason for non-use of RM system.
Hilton et al. (2013)	- "Consideration and commitment to the second implant": mixed feelings- excitement, fear and discomfort, importance of the decision, adjustment and effort required post-implant. - "Feeling different in a hearing world": dealing with isolation, looking different, prejudice, and annoyance at not being able to hear everything.
Israelite et al. (2002)	- "Fitting in the mainstream": important, yet complex. - Experienced marginalisation, but feel closer to hearing students and marginalised Deaf. - Relationships with peers and teachers important socially, academically and for independence in less supportive environments at school. - It is important for hearing impaired adolescents to have peers with whom to identify.
Kent & Smith (2006)	- Some students did not mind others knowing they had a hearing impairment whilst others did. Students voiced their frustrations with having a hearing impairment. - Having understanding family and friends helped these students' development.

Study	Other Findings
Kops (2003)	- Other major themes included students feeling close to their families, feeling similar to peers based on personal qualities and not hearing impairment, mastery of a skill defining part of their identity, and relationships with hearing and deaf peers not changing as a result of getting a CI. - Additional minor theme included some students wanting to connect more with others post-CI implantation.
Luckner & Muir (2001)	Numerous factors contributed to the success of these students, such as involvement from family, self-determination, self-advocacy, having early identification and intervention of hearing impairment etc.
Morris (2017)	- Only one student had lower than normal self-esteem. - All students felt confident hearing in 1:1 situations, with this reducing as listening situations became increasingly complex and with larger groups. - Students more often participated in smaller group than whole class discussions. Students participated most in social situations. - Most used appropriate seating, followed by a Teaching Assistant, and asking the teacher or peers for clarification. - Most participants enjoyed school, with the main reason being due to friends, as well as enjoying lessons.
M. Park (2015)	All students had different experiences, however neither the public nor state school fully supported the educational needs of these students- opportunities for engagement in their school and community were lacking most.
Punch & Hyde (2005)	- No significant difference regarding social loneliness and participation between these students and their hearing peers. However, the interviews were able to delve deeper and provide insights in this area that the questionnaire could not. - "Social participation": some students knew a lot of students at their school, but had hardly any close friends, and reported feelings of loneliness. Some experienced misunderstanding due to mishearing/not hearing what others said. Few students reported no social issues. - Issue of students wanting to be treated normally, but also wanting others to make accommodations for their hearing loss. - Some felt their hearing loss made them more shy, self-conscious and less confident in themselves. - Students had fears about future career prospects, and demonstrated awareness of limitations their hearing loss might have on particular jobs.
Sari (2005)	Students who used multiple modes of communication e.g. fingerspelling, signing, lip reading whilst using amplification etc. were more likely to identify as bicultural and achieve successful communication.

Study	Other Findings
The Ear Foundation (2014)	18 out of 20 teenagers had not used their RM system at home because: - Not of benefit or need. - Feelings that it was owned by/only for use at the school and so could not be used at home. Some were interested in trying it out at home in situations such as watching TV or helping with chores. The students appeared to benefit from using an RM system at the three trialled activities involving noisy situations and distance from the speaker (rock-climbing, canoeing and visiting the museum).
Wennergren (2008)	- Two thirds of the students preferred to use just a hearing loop system when in small groups (not in conjunction with any other assistive technology e.g. conference system). - Students had a lack of knowledge regarding how the loop system worked, complaining it was too loud, when this is controlled via the H/Aid, not the classroom. - Students wanted to hear more background sound for more awareness (e.g. others in the room), but less background noise (e.g. fans, printers etc.). - Students stressed the importance of having good visuals in class. - Knowledge of the rules of conversation (e.g. intonation) was important to the students. - Students expressed their desire to have comfortable surroundings.
Wheeler et al. (2007)	- "Advantages": hear friends, family, environmental sounds and music better. Speech production was improved and some felt it was better than wearing H/Aids. - Students suggested the CI be waterproofed and be permanent. - "Disadvantages": some included the CI operation, headaches, processor falling off, not being able to do certain activities e.g. scuba dive. Some still struggled hearing in background noise and listening to quiet speech or multiple speakers. Degradation of the equipment meaning possible re-implantation. Fear of being physically more vulnerable in an accident due to believing part of the skull where the CI is had been thinned due to CI surgery. - "Understanding of the technology": Small number of students had a full explanation of CI, but most knew how to troubleshoot it. - "The decision about implantation": students seemed grateful and appreciable for receiving a CI and believed it necessary for parents to have to make the decision for particular children. - "Communication: A lot of the students could sign in addition to speaking. - "Education": Students appreciated their CI, but some also relied on a Teaching Assistant. Some felt the transfer to secondary school could have been made easier. 5 students reported being bullied at school. - "Advice to others": students recommended the implant to others where necessary (e.g. some said to try H/Aids first).
Woods (2020)	- Elements of Deaf culture were prevalent at this school e.g. American sign language (ASL) and ASL club, but there were few socialisation opportunities. - Some poor behaviour from hearing impaired students was ignored by teachers. Teachers did not always acknowledge the issues regarding lag with interpreters and the pace of the class. - Hearing impaired students did not feel disadvantaged academically at school, but rather socially.